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ABSTRACT

A continuation of an earlier manual, this guide was written to help adult education teachers and their students to go beyond the information of part 1 and learn more about the uses of computers. Although this manual is directed more toward teachers and administrators than toward students, activities for students are provided. As in part 1, some of the manual has been written so that instruction can be given with or without a computer; it can be used in a computer literacy class or as part of a class in some other area, such as English or mathematics. This manual is organized in six sections. The first five sections cover the following topics: computer review; software applications (word processing, database, spreadsheets, and BASIC programming); evaluation of software (including an annotated resource guide and a software buyer's guide), graphics, and computer-assisted instruction. Each section contains information (including reprints of materials from a variety of sources), learning activities for students, and test items. Materials are illustrated with line drawings. The final section contains reprints of brief articles about computer literacy. (KC)

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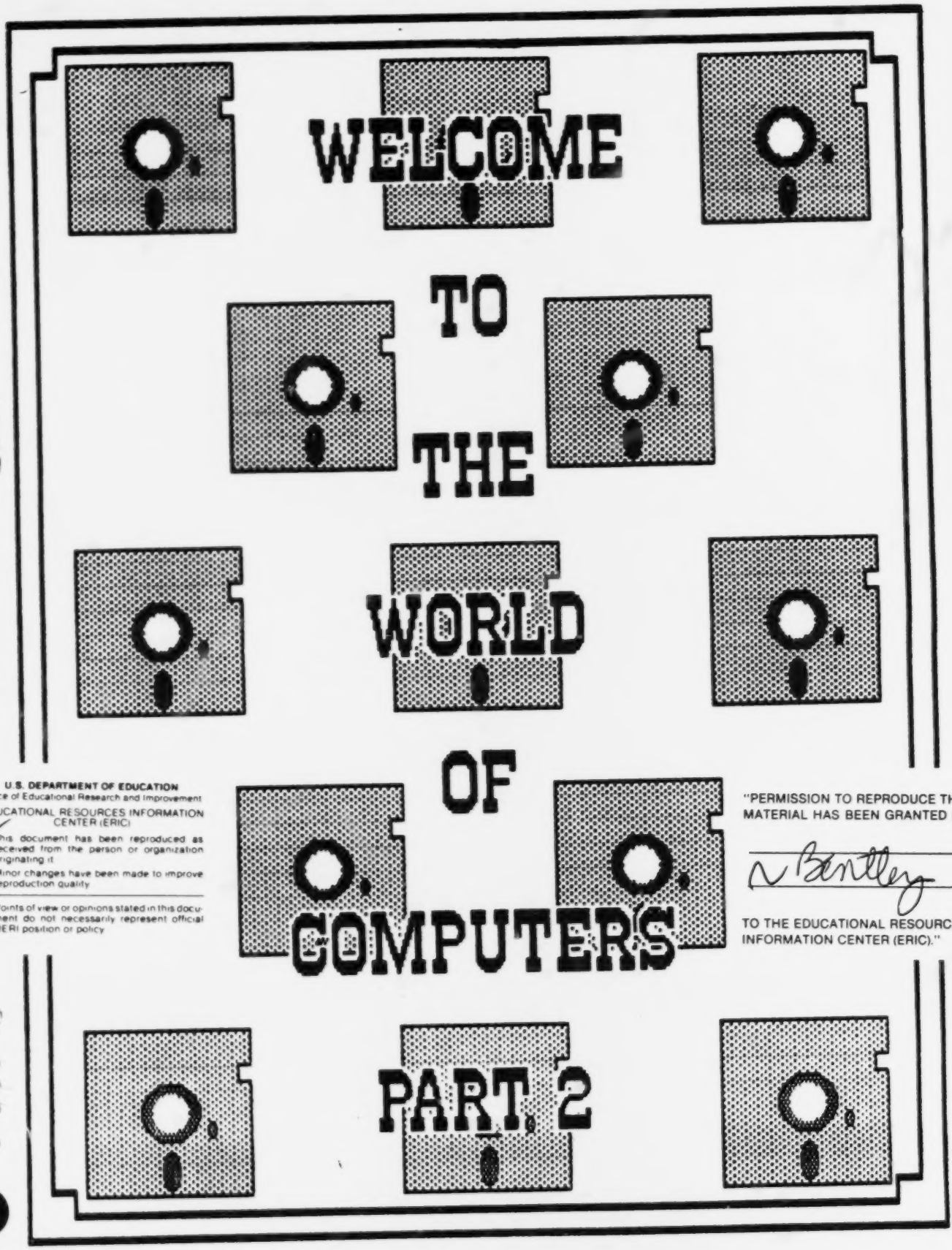

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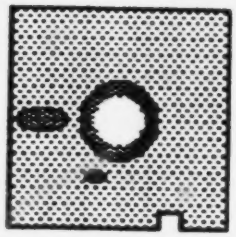

INTRODUCTION

The original "Welcome to the World of Computers" was written because of a need to acquaint adult students and teachers with computers and their functions. "Welcome to the World of Computers", Part 2 was written because the students and teachers indicated a need to go beyond Part 1 and learn more about the computer's uses such as basic programming, evaluating software, Computer-Assisted- Instruction, etc. Adult Education directors indicated interest in learning more about data base programs to keep track of student enrollment, and spreadsheets to readily look at their budgets and make needed changes.

"Welcome to the World of Computers", Part 2 is written more for the teacher or administrator than student, but activities for students have been included throughout the manual. As in Part 1 the activities have been written for different levels of students.

Also, as in Part 1,some of the manual has been written so that instruction can be given (or information received) with or without a computer; as part of an established class, or as a complete class just on computer literacy.

Remember, computers are fun! If you have any questions, suggestions, just need assistance or want to talk, please call us:

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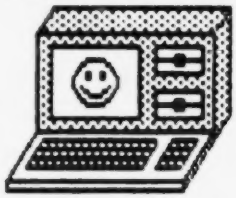
COMPUTER REVIEW



Remember - a computer is just a machine. It really isn't smart at all. A computer is very obedient. Except when there is a power failure or some part inside the computer breaks down, it will always do exactly what it is told.

. A computer has a super memory.

  - ROM (Read Only Memory) stores information that is put into the computer in the factory. It doesn't change.

  - RAM (Random Access Memory) stores the information that people type into the computer. RAM keeps changing.

. A computer is very fast. In a matter of seconds, it can solve problems that would take a person many days to do.

. A computer is accurate. It does not make mistakes. If you give it the right information, it will give you the right answer.

. A computer doesn't get tired. It runs on electricity. It doesn't need sleep.

A computer must be told exactly what it has to do. Someone must put information into the computer's memory. Someone must give the computer instructions on how to use the information. These instructions are called a program. The person who tells a computer what to do is called a programmer. The programmer understands how computers work to solve problems.

Computers solve problems in three steps.

1. INPUT. Input includes all the information and instructions that go into the computer. Input can be typed into the computer on a keyboard, or through a scantron machine. Computers can't solve problems unless they get input.

2. PROCESS. The computer processes or works on the information in its Central Processing Unit (CPU). This is where the computer solves all its problems.

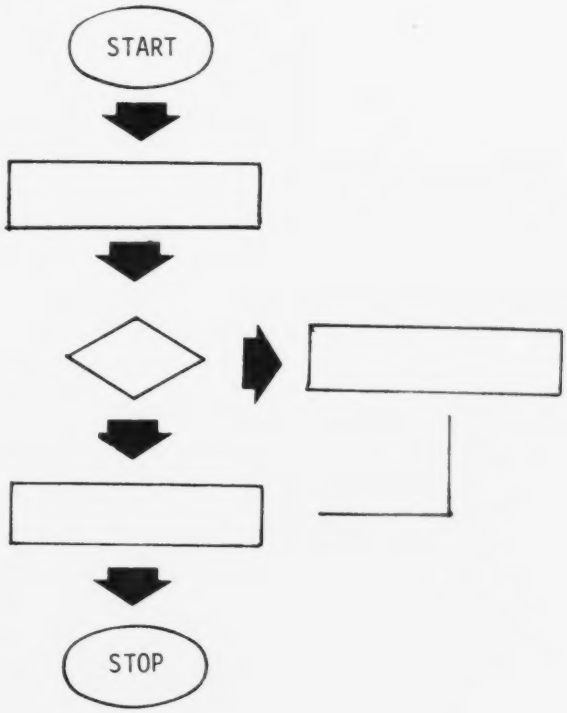
3. OUTPUT. Output is the answer to a problem. The computer puts its output on the monitor's screen, or it prints it out on a printer.

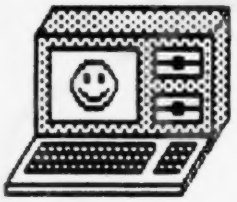
A programmer can use a flowchart to plan programs for the computer. A flowchart is a diagram showing the main steps needed to solve a problem. A flowchart shows the steps in the right order.

Special symbols are used to make a flow chart.

- OVAL comes at the beginning and end of the flowchart.
- ARROW points from one step to the next.
- RECTANGLE tells what has to be done in each step.
- DIAMOND makes a decision (always has a yes and no arrow).

In a flowchart you must follow all the arrows until you get to STOP.





PARTS OF A COMPUTER

. Microcomputer - a small computer (with ? K of memory) usually with a keyboard, monitor disk drive, and a printer.

. The numbers of K's (16, 48, 128) tells how much information the computer can hold.

. Monitor looks like a TV set (Hardware).

. Disk drive is a small box-like machine with a narrow door on it (Hardware).

. Disk looks like a square record. It has programs, games, and data stored on them (Software).

. Printer is the machine that prints the computer output on paper.

. The computer keyboard looks like a typewriter keyboard.

. When you want to leave a space between letters, you press the space bar.

. Whenever you want to start (type) a new line, you press the return or enter key.

MINI QUIZ

A. Your teacher has all the GED scores from her class. She wants to know how many people passed their GED test. She is going to use the computer to help her arrange the scores and make a report. Circle the step the computer is using to help solve your teacher's problem.

1. The computer prints out the student's names and scores on the printer.

   INPUT PROCESS OUTPUT

2. Your teacher types all the student's scores into the computer.

   INPUT PROCESS OUTPUT

3. The computer shows the average of the classes' GED test scores on the monitor.

   INPUT PROCESS OUTPUT

4. The computer adds the GED scores and divides by the number of students in the class to find the class average.

   INPUT PROCESS OUTPUT

5. The computer arranges all the student's names in alphabetical order.

   INPUT PROCESS OUTPUT

B. Henry solved some arithmetic problems using the computer. He put some numbers (data or input) into the computer and receives the answers (or output). Can you circle the correct process the computer used to get the answers? The first two are already done.

	INPUT	PROCESS	OUTPUT
1.	7, 4	⊕ - x ÷	11
2.	6, 3	+ ⊖ x ÷	3
3.	8, 13	+ - x ÷	21
4.	18, 6	+ - x ÷	12
5.	8, 3	+ - x ÷	24
6.	21, 3	+ - x ÷	7
7.	38, 21	+ - x ÷	17
8.	90, 10	+ - x ÷	9
9.	6, 6	+ - x ÷	36
10.	7, 49	+ - x ÷	7

MINI QUIZ CONTINUED

ROM	input	BASIC	program
RAM	data	computer	programmer
memory	CPU	output	flowchart

C. Each of these words completes a sentence below. Fill in each blank.

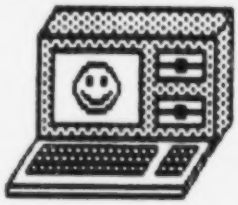
1. A computer language most computers use is _____.
2. The information that we put in (input) to the computer is called _____.
3. A machine that solves problems is called a _____.
4. A computer stores information in its _____.
5. The two kinds of computer memory are ____ and ____.
6. We give the computer instructions in a _____.
7. The step in which information and instructions get into the computer is called _____.
8. The person who gives the computer the information it needs to solve problems is called a _____.
9. The computer processes information in the ____.
10. When the computer shows you the answer to a problem it is called _____.
11. In order to diagram the main steps needed to solve a program, the programmer sometimes uses a _____.

MINI QUIZ ANSWERS

A.
1. output
2. input
3. output
4. process
5. process

B.
1. +
2. -
3. +
4. -
5. x
6. ÷
7. -
8. ÷
9. x
10. ÷

C.
1. BASIC
2. data
3. computer
4. memory
5. ROM, RAM
6. program
7. input
8. programmer
9. CPU
10. output
11. flowchart



MATH

Because we use the "BASIC" computer language when given the computer instructions, some of the math signs the computer uses in solving problems are different than we usually use in the classroom.

WE USE	THE COMPUTER USES (BASIC LANGUAGE)
+ (plus)	+
- (minus)	-
x (times)	*
÷ (divided by)	/
= (equals)	=

EXAMPLES:

Seven times nine equals sixty-three	7*9=63
Forty-nine divided by seven equals seven	49/7=7
Twenty minus ten equals ten	20-10=10
Three times three equals nine	3*3=9
Nine plus eight equals seventeen	9+8=17

SOFTWARE APPLICATIONS

ESSENTIAL ELEMENT III

USE OF THE COMPUTER AS A TOOL

A. Use commercial software packages in a variety of applications.

   1. Use a word processor to generate documents such as letters, reports, or homework.

   2. Use a data filing system for simple data storage and retrieval, such as a simple phone or address listing.

   3. Use a spread sheet package to solve a meaningful problem such as checkbook calculations.

   4. Use graphics utilities to solve problems such as computer aided design of floor plans.

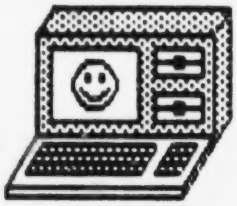
   5. Use the computer for other applications, based on software availability.

B. Demonstrate the ability to review and evaluate commercial software as to its effectiveness for intended purpose and ease of use.

C. Identify which kinds of application software are appropriate for given tasks.

D. Demonstrate skills for data entry and error checking in the context of application packages such as a data filing system.

WORD PROCESSING



WORD PROCESSING

Word processing is the combination of people, procedures, and equipment that transforms ideas into printed communications.

A word processor is actually several tools joined into one. A complete word-processing system is made up of:

- A microcomputer,
- A keyboard,
- A monitor,
- One or more disk drives or tape drives (cassette players),
- A word-processing program that comes on a disk or on a tape cassette. (The program gives the computer instructions for processing words.),
- A printer for making "hard copies" (copies on paper) or what you write.

There are many word processing programs (on disks, cassettes cartridges), that will turn a general purpose microcomputer into a word processor. There is also a "dedicated word processor" which is a computer with a built-in word processing program; that program is the only one that the computer can run. (It can not run a variety of programs like a general-purpose computer.)

A word processor is made up of two parts. The first part (the text editor) lets you enter and change writing (text) on the screen. The second part (the text formatter) lets you send the writing to the printer exactly as it will appear on the printed page.

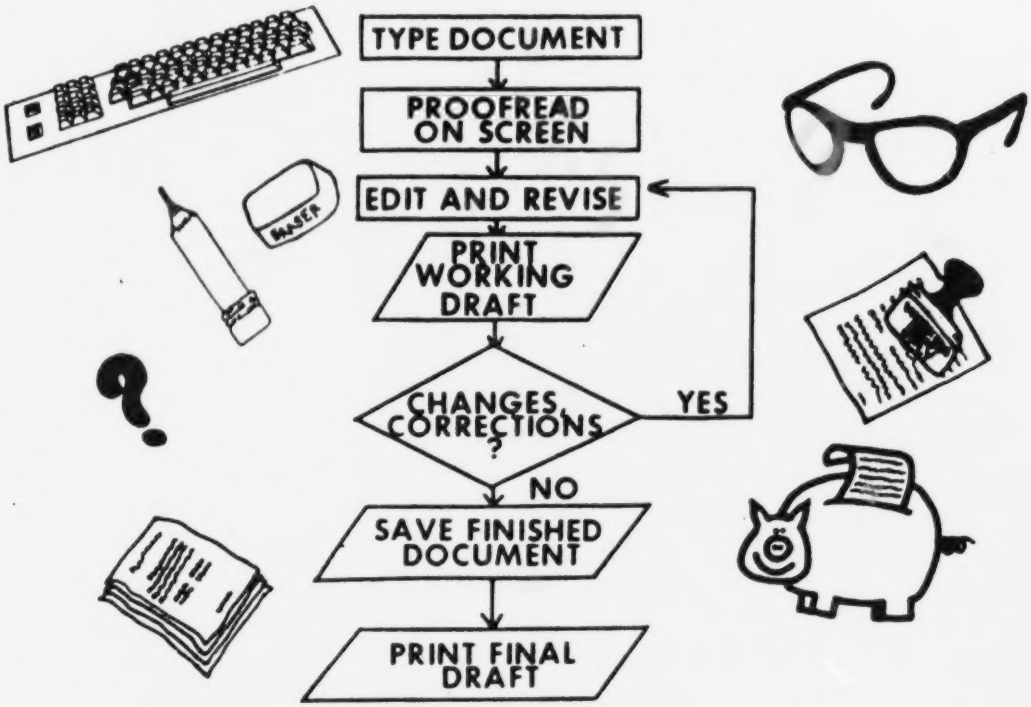
A word processor allows you to use your computer in much the same way you would use a typewriter with some exceptions. With the word processor, you can insert, delete and move words, sentences, or paragraphs around. You can save what you've written and go back and change it later.

HOW THE WORD PROCESSOR WORKS

After you load the word processing program into your computer, you use the keyboard as you would an ordinary typewriter. Instead of appearing on paper (as in typing), the words appear on the monitor (screen). Everything you type is stored in the computer's memory and can be saved for later use.

The best thing about word processing programs is that they make it easy for you to add to, change, erase, or correct your work.

WORD PROCESSING WORK FLOW



IMPORTANT TERMS TO KNOW BEFORE YOU USE THE WORD PROCESSOR

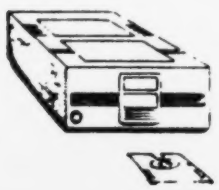
DOCUMENT - Anything you type on a word processor is called a document or a file. Before you begin writing your document, most word processing programs require that you give it a name. This is called a filename. Most word processors have rules that limit your choice of a filename.

LOAD - Before you type your first word,you have to LOAD the word-processing program into the computer's memory. This is done through various input devices.

LOAD

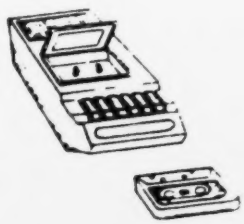
INPUT DEVICES

Disk Drive



Floppy Disk

Tape Player



Cassette

SCREEN DISPLAY - A word processor's screen display is the number of characters (letters, numbers, symbols, and spaces) that can be displayed on the screen of your monitor at one time.

A CHARACTER - Is a letter, number, punctuation mark, symbol, or space that you type onto the computer screen. The screen is like a piece of graph paper with invisible lines that make hundreds of boxed-in areas (positions). Most of these areas are filled with characters you type in, while some areas are filled in by characters just for the word processor and they do not show up on the screen.

CURSOR - A cursor is a small patch of light that moves on the computer screen as you work. The word cursor comes from the Latin verb currere, "to run." It may be a solid rectangle, an underline, or a special symbol. On some word processors, the cursor blinks off and on, on others it shines steadily.

Whenever you see the cursor on your screen, you know that is the spot where the next character you type will appear. As you type, the cursor moves.

WORD WRAP - In most word processing programs you do not have to worry about the carriage return or the RETURN (ENTER) key as you write. When you come to the end of a line, the cursor moves to the beginning of the next line automatically. This is called word wrap or wrap-around. If the line ends in the middle of a word, the word (or part of it) moves down with the cursor.

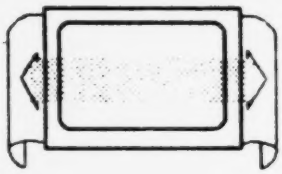
MENU - When you first load your word processing program you will see a list of the things your program can do. This list is called a menu. This menu can either be made up of words or pictures (ICONS).

MODE - This is a section on a word-processing program devoted to a particular set of tasks. Usually there are tasks that are involved in writing, editing, saving and printing and are grouped by themselves.

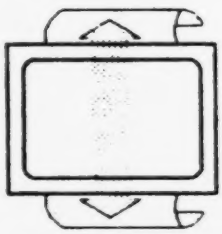
SCROLLING - The computer screen is like a window through which you see one section of your text at a time. Scrolling is moving text either horizontal or vertical onto or off the screen, either by line-by-line or in blocks. You scroll when you want to see a part of the document that precedes or follows the present screenful.

SCROLLING

To see sections of documents which are not currently in view, scrolling of the text can be either horizontal or vertical.



HORIZONTAL SCROLLING



VERTICAL SCROLLING

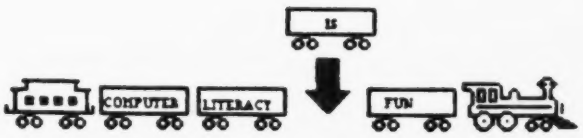
VARIATIONS:

Line by line
Screen by screen

TRANSPOSING - When you transpose two characters or two words, you make them change places with each other. If your word processor does not have a command for transposing you can still make characters and words change places by first deleting and then inserting.

WORD INSERT - The word insert usually means to add characters to existing text -- to place new characters in between other characters you've already typed.

"Insert" allows you to split the text and add words or characters.



CENTERING - To type or print a line of text so that it has equal margins (equal space on both sides), a word processor centers text by putting the same number of characters to both left and right of the center point.

REPLACING - To get rid of a character that you've typed and replace it with another character.

MARKING BLOCKS - A block of text can be anything from a word to a whole file. A block is a section of your document that you want to handle as a unit. Marking a block means to show with signs or highlighting the beginning and end of a block of text.

COPYING A BLOCK OF TEXT - When you copy a block of text, you leave it in the original location but repeat it in one or more other places. The original text is not destroyed.

(Block copying comes in handy when you type the words of a song for example and want to repeat the chorus after each verse.)

MOVING A BLOCK OF TEXT - When you move a block of text you take it away from one place and put it in another.

BLOCK ACTION COMMANDS

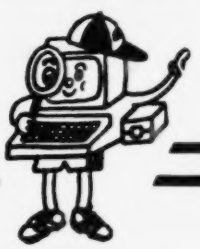
MOVE:

The move operation allows you to move a block of text from one location to another.

FINDING WORDS IN THE TEXT - Your word processor can search through your text and find the word or words you specify. Other words for finding are "search" or "locate."

SEARCH

SEARCH is used to find every occurence of a word, phrase, or block, of text.



DELETE - Delete allows you to remove a word or character.

DELETE

ALSO, used to "ERASE" a block of text from a document.

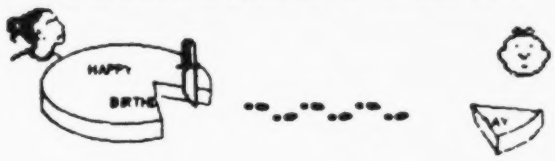
☐ DELETE

Used to "erase" a block from a document

FINDING AND REPLACING - Finding a word or phrase and replacing it with whatever other word or phrase you specify.

REPLACE

REPLACE is used to change a word, phrase, or block of text to a different set of characters.



ERASING A BLOCK OF TEXT - Same as deleting or removing text from your word processor or from a storage disk. In some word processors when the computer erases lines that you have marked, it removes them from the screen, but also stores them in a section of its memory called a buffer. If you change your mind, you can get the deleted material back from the buffer by pressing a certain key.

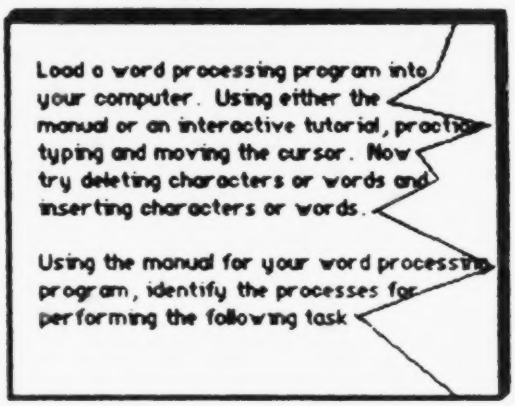
ADJUST -

ADJUST:

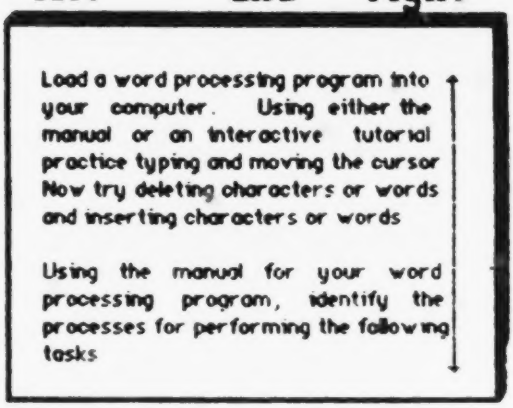
The adjust or align block operation allows you to change the format of a block of text to match the format of another paragraph in the document.

JUSTIFYING

Ragged Right


Load a word processing program into your computer. Using either the manual or an interactive tutorial, practice typing and moving the cursor. Now try deleting characters or words and inserting characters or words.
Using the manual for your word processing program, identify the processes for performing the following task

Justified Margins left and right


Load a word processing program into your computer. Using either the manual or an interactive tutorial practice typing and moving the cursor Now try deleting characters or words and inserting characters or words
Using the manual for your word processing program, identify the processes for performing the following tasks

Word processing programs can accomplish justification by either inserting extra spaces between words or controlling the space between letters.

FORMATTING

WHAT IT CAN DO FOR YOU?

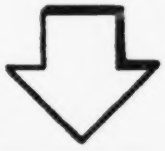
Allows determination of :

1. linespacing
2. placement of page numbers
3. width of margins
4. size/style of print
5. indentations
6. underlining

Takes You From This

Objective. Use commercial software packages in a variety of Applications Word Processing: cursor movement, tab setting, deleting a character, deleting a word, deleting a line, inserting a character

To This

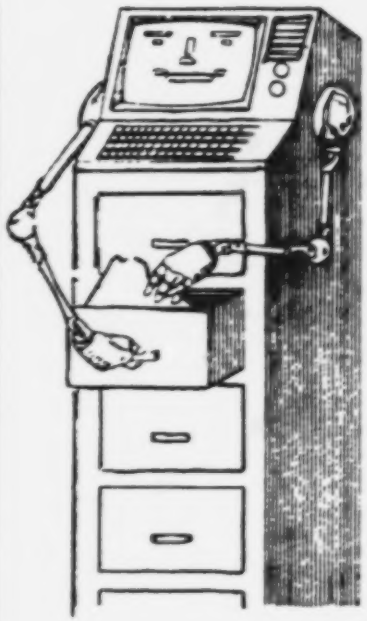


OBJECTIVE: USE COMMERCIAL SOFTWARE PACKAGES IN A VARIETY OF APPLICATIONS

WORD PROCESSING

- -cursor movement
- -tab setting
- -deleting a character
- -deleting a word
- -deleting a line
- -inserting a character

SAVE



To transfer from the computer's memory (workspace) .....

To a storage disk.

-Saving prevents work from being lost when the computer is turned off.

-Saving allows you to use old documents to create new, similar ones.

-Saving requires a filename.

THE PRINTER

To generate a printed copy locate the commands/keys to accomplish the following:

1.) Print whole document

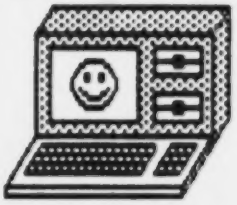
2.) Print specific page or pages

3.) Print a selected block of text

4.) Interrupt printing

5.) Print control codes for changing font size or emphasis (bold,etc.)

6.) Line feed, form feed, and paper loading



WHAT CAN YOUR WORD PROCESSOR DO?

There are different word processing software programs such as, Appleworks, Apple Writer, Super Scripsit, Framework, and PFS: Write, Bank Street Writer, and Paper Clip.

The checklist on the following pages lists all the functions a word processing program usually does. The set of instructions has been left blank so you can fill in the "How To" according to the word processing program you are using while working on the activities.

Depending on the Word Processing software you are using, your computer should do the following:

It should have:

- Cursor Control - means we can move the cursor anywhere on the screen.
- Standard Editing Functions -
  - . Delete - the delete function erases characters (words, lines or a paragraph).
  - . Insert - the insert function lets you insert a word, sentence, or paragraph wherever you'd like.
  - . Search and replace - lets you find a particular letter, word or sentence and replace it with another letter, word, or sentence.
  - . Block Operations - a block is defined as all characters between two marked points in the text. You can move this block of characters (words, sentences) to other locations, or delete a block of characters.
- Standard Formatting Functions. (Formatting lets us decide how the text (words) will appear on the printed page after it is sent to the printer.)

Space formats include:

- Margins (left, right, top, bottom).
- Tabs.
- Justification - means lining up the ends of the lines. Left justification means all lines are straight on the left side; right justification means all lines stop at the same place on the right side.
- Centering - can center titles, or lines.
- Headers - are bits of texts that appear at top of each page. Footers appear at the bottom of the page.
- Line spacing - you should be able to specify single, double, or triple spacing of text.

Form formats include:

- Boldface - makes the text stand out.
- Underlining.
- Superscripts - sometimes used in footnotes and subscripts used for mathematical notations.

Your Word Processor program should also have:

- File Merge - means you can separate text files from one disk or one file to another.
- Help directory - lets you remember some of the commands for your word processor you may have forgotten. Two types of help are available: <u>continuous</u> in which a section of the screen is set aside for help messages and <u>on demand</u> in which the help message overwrites part of the screen when you call it up.
- File size - is the maximum space allowed per text file.
- Automatic Backup - makes a backup copy of the file on which you are working.
- SWIG - or See What I Get - means what you view on the screen is what is printed out on paper.
- Mail Merge - lets you combine your word processor with a data base to prepare form letters or other personalized documents.

- Embedded Printer Commands - lets you switch the type of lettering (fonts) you use, page length, margins, and page numbering.

- Printer Support - refers to the process of making the word processor communicate with the printer.

- Add-On Packages - spelling checker checks the spelling of words in your text against a dictionary stored on disk. Grammar checker checks commas, proper punctuation, capital letters. Thesaurus lists synonyms. Style checker checks for stylistic errors, i.e., awkward phrases, cliches.

- Integrated Packages - combines word processing with spreadsheet and database management programs.

WORD PROCESSING CHECKLIST

SOFTWARE PROGRAM _____

W P CATEGORY	WHAT IT DOES	HOW TO DO IT
Getting Started	Put program disk into disk drive before or after turning on computer.	
	Command to type to tell computer to load program into memory.	
	Command needed to quit or exit from program.	
	Information screens?	
	Menu--do you need to indicate a choice?	
	Need to answer any questions before writing.	
	Need to make up a file name.	
	What does writing screen look like?	
	Type of cursor.	
Entering Text	How do you type capitals on keyboard?	
	Do keys on the keyboard repeat when you hold them down?	
	Correcting a typing error.	
	Key to press to start a new line.	

WORD PROCESSING PROGRAM

W P CATEGORY	WHAT IT DOES	HOW TO DO IT
Entering Text Cont'd.	Maximum number of characters you can put on one line.	
	Maximum number of lines the screen holds.	
	What happens when you fill the last line on the screen?	
	How do you return to the previous screen of text?	
	How do you start over with an empty screen?	
	What happens when you press the TAB key?	
Moving the Cursor	Can you move cursor without erasing?	
	How do you move cursor?	
	Can cursor be moved by giving it a command?	
	Can cursor move faster?	
Deleting Characters	The character preceding the cursor.	
	The character the cursor is on.	
	The word preceding the cursor.	
	The word following the cursor.	

WORD PROCESSING PROGRAM

W P CATEGORY	WHAT IT DOES	HOW TO DO IT
Deleting Characters Cont'd.	Everything to the right of the cursor on the same line.	
	The whole line.	
Inserting (Add) Characters	Do you need a certain mode/ menu to insert character?	
	Special instructions or keys to hit before inserting.	
	Where do you place cursor before insertion?	
Replacing Characters	How do you get rid of a character you've typed and replace it?	
	Do you need to delete the unwanted character and type a new one in its place.	
	What command do you have for a strikeover or over-write operation that allows you to type the new character over the old?	
Transposing	Special command for transposing two characters.	
	Special command for trans-posing two words.	
	Place for cursor to transpose characters.	
	Place for cursor to transpose words.	

WORD PROCESSING PROGRAM

W P CATEGORY	WHAT IT DOES	HOW TO DO IT
Inserting Words	How do you insert a word or string of words?	
	What if the insertion runs onto a new line and then leaves part of the new line blank.	
	How do you insert a paragraph break?	
Scrolling	Can you scroll horizontally? How many spaces?	
	How do you scroll to the previous line?	
	To scroll to the next line.	
	Command to scroll more than one line at a time.	
	To make lines scroll continuously.	
	To scroll at different rates of speed.	
	Any specific scroll commands.	
Marking Blocks	How to mark a block of text.	
	What shows on screen when you mark a block?	
	Can you start/end a block in a middle of a line?	
	Way to cancel the marking of a block.	

WORD PROCESSING PROGRAM

W P CATEGORY	WHAT IT DOES	HOW TO DO IT
Marking Blocks Cont'd.	Limit to the size of block you can mark.	
Erasing a Block of Text	Certain mode/menu needed to erase a block of text.	
	How do you erase after marking the block?	
	Can you erase a block without first marking it?	
	Can you get back what you erased?	
	Command needed to adjust lines after erasing.	
	Limit to number of characters/lines you can get back after erasing.	
Moving a Block of Text	Specific mode/menu to move block of text.	
	How do you show WP where you want block of text moved to?	
	Command used to move the block.	
	Can you move block back where it was before?	
Copying a Block of Text	Is there a copy function - menu/mode?	
	Steps needed to copy block of text.	

WORD PROCESSING PROGRAM

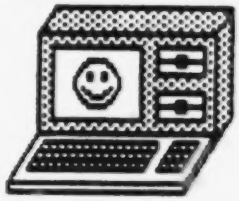
W P CATEGORY	WHAT IT DOES	HOW TO DO IT
Copying a Block of Text Cont'd.	How do you show where you want copy to be placed?	
Finding Words in the Text	Certain mode/menu needed to select FIND or SEARCH.	
	What command is needed to find something?	
	Any restrictions on what the WP will find?	
	How will you know when WP has found word?	
	How do you tell WP to find next occurrence of word?	
	Are there any "wild cards" symbols to stand for any letters?	
Finding & Replacing	Need a certain mode/menu to select REPLACE.	
	What command is needed to make WP find and replace something?	
	Is there a command for "search & query?"	
	Will the WP replace without asking permission?	
	Restrictions on length of replacement.	

WORD PROCESSING PROGRAM

W P CATEGORY	WHAT IT DOES	HOW TO DO IT
Saving Your Work	Do you have initialized formatted disk or cassette?	
	Need certain mode/menu to "save" your work.	
	Command needed to "save" document.	
	Must you save all text, or part?	
	Restrictions on file name.	
	How do you review catalog of files on the disk or cassette?	
Retrieving a File	Certain mode/menu to retrieve file from storage.	
	Command needed to retrieve file.	
	How do you merge two files?	
Formatting/Printing	Menu/mode needed for printing.	
	Functions you can use - commands needed. --Number of characters on a line. --Number of lines on a page --Change page break --Single, double, triple spacing --Justifying margins --Indenting --Centering	

WORD PROCESSING PROGRAM

W P CATEGORY	WHAT IT DOES	HOW TO DO IT
Formatting/Printing Cont'd.	--Type of characters --Underscoring --Super/sub scripts Pausing in printing. Other printing commands.	



Most of the activities in this Word Processor section can be attempted using any Word Processing Software application you currently have in your classroom.

Popular Word Processors currently on the market include:

WORD PROCESSORS UNDER $100:

TI Writer - TI

Atari Writer - Atari

Bank Street Writer - C-64, Apple II, Atari, IBM PC/PC Jr.

Color Scripsit - Radio Shack

Easy Script - C64

Friendly Writer - IBM PC

Mac Write - Apple Macintosh

Paperclip - C-64

PC-Write - IBM PC/PC Jr.

Write, Edit and Print - IBM PC/PC Jr. Apple II, C-64, TRS 70 Model I/III

WORD PROCESSORS OVER $100

Apple Writer II, III - Apple II, III

PFS: Write - IBM PC, Apple II

Super scripsit - TRS 80 Model III/IV

Word Star - IBM PC/PC Jr., Apple II, Zenith

ACTIVITY #1 - Input.

With your Word Processing program, type in the following sentences. Don't worry about correcting errors. Just type the lines below and finish each sentence.

My name is _____.

My phone number is _____.

I am taking an Adult Education class in _____.

My favorite color is _____.

Today I hope to _____.

Go to ACTIVITY #2 without turning off the computer.

ACTIVITY #2 - Scrolling.

The computer screen is like a window through which you see one section of your text at a time. To see other sections, you have to "scroll" the text up or down, right or left. The term "scroll" suggests a resemblance to the scroll documents of ancient times. Although a computer does not look like the long strips of paper that could be written on and rolled up, many people find that the image of reading up and down helps. Some word processors move to the "next screen" (instead of scrolling down) or move to the "previous screen" (instead of scrolling up).

Use the sentences you completed in ACTIVITY #1 to determine how your computer performs the following. (Does it use ↑ or ↓ or → or ← or a function key?)

1. Move the cursor to the bottom of what you've written.

2. Go to your phone number line.

3. Go to the last line.

4. Go to the first line (Can you do it without using the arrow keys?)

ACTIVITY #3 - Inserting

The word insert means to add characters to the words already on the page. Find out the key or command you need to use on your word processor to insert a character, then type the words in the columns below:

1. sap
2. men
3. boom
4. sat
5. for
6. raid
7. lap
8. eat

Now, using the insert key or command, insert a letter to change each of these words to mean what is listed below. For example, to change "sap" to a word meaning a "cleanser" we would insert "o" to make the word "soap."

1. cleanser
2. nasty, terrible
3. to flower
4. chair
5. quartet
6. pigtail
7. lighting fixture
8. toward the sunrise

ANSWERS: soap, mean, bloom, seat, four, braid, lamp, east

ACTIVITY #4 - Inserting Characters

Type the sentences and then decide where the characters indicated below need to be inserted to make the sentence correct.

1. The team rose from the tea kettle.
2. Please do not lose this door.
3. I will give you five cents or each empty bottle.
4. The princess sat at the window, combing and low-drying her hair.
5. The cattle were gazing in the pasture.
6. It was our fist fight; I do not remember the case.
7. The pioneers traveled wet in wagon rains.
8. A lit pane with teen students aboard is missing.
9. Noone here knows how to count to 144 by elves.

LETTERS THAT NEED TO BE INSERTED:

1. s
2. c
3. f
4. b
5. r
6. r, u
7. s, t
8. gh, l, fif
9. one space and tw

ANSWERS:

1. steam
2. close
3. for
4. blow
5. grazing
6. first, cause
7. west, trains
8. light, plane, fifteen
9. No one, twelves.

ACTIVITY #5 - Deleting

Decide what key or command your word processor uses to delete a character, or word. (Some word processors use the delete key, or back space, or space bar.) Then type these nine sentences.

1. I'm not just bragging when I say I'm the most popular fellow in school.
2. I guess I have at least two dozen close friends.
3. Recently I received a letter proposing marriage from someone I have never met.
4. My savings account has six thousand dollars in it.
5. I have a scrapbook of newspaper stories about my exciting trips to foreign lands.
6. On my desk is a photo of me driving a Mercedes Benz.
7. Ivy College keeps telling me not to forget to apply for admission.
8. I am going to get a Ph. D in European history.
9. My uncle is a commander in the navy.

As you can see, the person who wrote these sentences is not being very truthful. By leaving out the following (deleting) characters and words, we can see what the person really meant to be writing.

1. not
2. dozen
3. proposing marriage
4. thousand
5. my
6. me driving
7. to forget
8. Ph.
9. com ... der in the navy

ACTIVITY #6 - Replacing.

How do you get rid of a character or word that you have typed and replace it with another? Type the following words and then using the key or command for replacing on your word processor, change 2 letters (characters) in each word to make a new word.

1. act
2. art
3. tow
4. owe
5. won
6. dairy

1. a grown-up kitten
2. rodent
3. 2
4. sorrow
5. possess
6. journal

ANSWERS:

1. cat
2. rat
3. two
4. woe
5. own
6. diary

ACTIVITY #7 - Moving Blocks

A block of text can be anything from a word to a whole file. A block is a section of your document that you want to handle as a unit. You may want to erase it, move it, copy it, or save it. Find the command, key, or process in your word processor in which text to be moved is marked. In many word processors, the beginning of a block of text to be moved is marked by moving the cursor there and pressing a key or combination of keys. The cursor is then moved to the end of the text to be moved and the same marking process is repeated. Next, the cursor is moved to the place in the document where the block is to be moved, after which, if you press a key or combination of keys, the block can then be copied and/or deleted and copied.

Type in the following poems:

Hickory dickory dock
The mouse ran up the clock
Its fleece was white as snow
And everywhere that Mary went
Hickory dickory dock

Mary had a little lamb
The clock struck one
The mouse ran down
The lamb was sure to go

Decide what key or command your word processor uses to move blocks of text. Make each of the poems read properly.

TEACHING AND COMPUTERS ◆ FEBRUARY 1986

WORD PROCESSING

the LEGACY of Morris Q. Moneybucks

BY THOMAS E. BOUDROT

This feature is really two articles in one. First and foremost, it is an article about how to help develop word processing skills. One of the "secrets" to doing this is to break instruction down into bite-size lessons, each of which introduces and helps develop one of five basic word processing skills. On the following pages you will find a student lesson on each of these skills:

- **File Retrieval.** This usually refers to the ability to retrieve or call up information from a disk.
- **Cursor Movement.** The cursor, that video marker that indicates where type will next appear on the screen, is essential to word processing. With the help of a word processing program, the cursor can move about and make corrections anywhere in text.
- **Text Deletion.** This is the process of removing characters, words, or blocks of type from text.
- **Text Insertion and Replacement.** The process of inserting characters, words, or blocks of type. Sometimes this is done in place of other text (*text replacement*); sometimes in addition to other text (*text insertion*).
- **Text Creation.** This is the sum of the previous four skills. Put them all together, and you are ready to create an original sentence, paragraph, story, poem, or essay. Words are now easily added, deleted, or otherwise moved about the screen. You'll be amazed how much quicker creativity comes.

Another "secret" to teaching word processing effectively is to incorporate language arts exercises into every lesson. This makes students aware of how word processing can make writing easier, hence, encouraging them to learn the necessary skills. The activities in this feature provide experience with editing, writing, and many other language arts skills, and can be performed on any word processing software.

This article has a second side to it. It is also the tale of the late Morris Q. Moneybucks and the outrageous incidents that result after the reading of his last will and testament. Morris was an eccentric old fellow who had original ideas on how his personal possessions should be divided among his three children, Doris, Horace, and Chloris . . . oh yes, and their faithful butler, Max. The complex story of his legacy unwinds throughout these word processing lessons. It is loaded with family intrigues, mysterious messages, and convoluted codes. Don't worry, though; they're all meant in fun. (Morris took care that no one would leave his estate empty-handed.)

This fascinating saga will motivate even the most reluctant word processor to work on and learn the five basic skills!

ACTIVITY 1:

HIDDEN PRIZE

Word Processing Skill: File retrieval.
Language Arts Skills: Following directions, making inferences.
Materials: Scrap paper, Student Task Card 1, and eight special data files: NOTE, CLOCK, PORCH, SINK, CELLAR, OVEN, CLOSET, and PIANO.

Preparation: Using a word processing program, create the following eight files:

File 1 NOTE

The first relative to read this note
Will get a special prize.
If he figures out the clues I wrote
And hid from greedy eyes

Start at the clock and read the clue.
I'm serious; this is not funny!

Write down the letter that fills the the blank.
It's worth a lot of money.
Keep reading my clues and filling their blanks.
Then look at the letters that you wrote down.
Add them together,
And see what you've found.

File 2 CLOCK

I have a _orch at the front of my mansion. Go there to find the second clue.

3 PORCH

There is a large s_nk in the kitchen. Go there for your next clue.

4 SINK

Way down in the cell_r is the next clue to this mystery. Are you stumped yet?

5 CELLAR

The ove_ is a great place for baking and for hiding clues! I'll give you another hint: you're getting warmer!

6 OVEN

Deep inside my bedroom cl_set you will find the last clue.

7 CLOSET

Read the five letters you have used to fill the blanks. They spell the name of my favorite musical instrument. Look into that to claim your prize.

(continued

8 PIANO

Congratulations! You now own my walrus tusk collection. I know that it will bring you great happiness. By the way, please dust the piano when you finish reading this note. I'd appreciate it!
Sincerely, Morris Q. Moneybucks

Cut out and laminate Student Task Card 1.

Demonstrate how to load a word processing program. Then show students the disk (or cassette) on which the eight files for this activity are stored. Boot up the disk and teach the class how to retrieve the file called NOTE.

Next, give students a little background on Morris Q. Moneybucks. Morris was not your ordinary rich man. He was what you might call an "eccentric." He left a will to his three children, but he also left notes all over his mansion that promised still another treasure to the first relative to arrive at his mansion and solve the clues in his notes. That's what this activity is all about.

Activity: There are eight notes in all; each is stored in a different data file and has a secret file name. Tell students to start their search for Morris' notes with the NOTE file they just called up. Each note, including this one, contains a clue to finding the file that follows it. The eighth file contains the prize. Students who can retrieve each file correctly will find what it is that Morris has left for the lucky relation who arrives at his mansion first. *(A walrus tusk collection.)*

ACTIVITY 2:

HOUSE HUNT

Word Processing Skill: Cursor movement.

Language Arts Skills: Following directions, making inferences.

Materials: A transparency of Morris' house (sample on this page), transparent adhesive tape, Student Task Card 2, and the HOUSE text file.

Preparation: Using your word processing program, make a screen full of periods. Save them under the file name HOUSE.

On a blank transparency sheet, draw Morris' house (as shown on this page). Tape the transparency to the screen. Be sure that when you call up the HOUSE file, the periods on the screen are aligned directly under the lines on the transparency. Position the cursor at the START position.

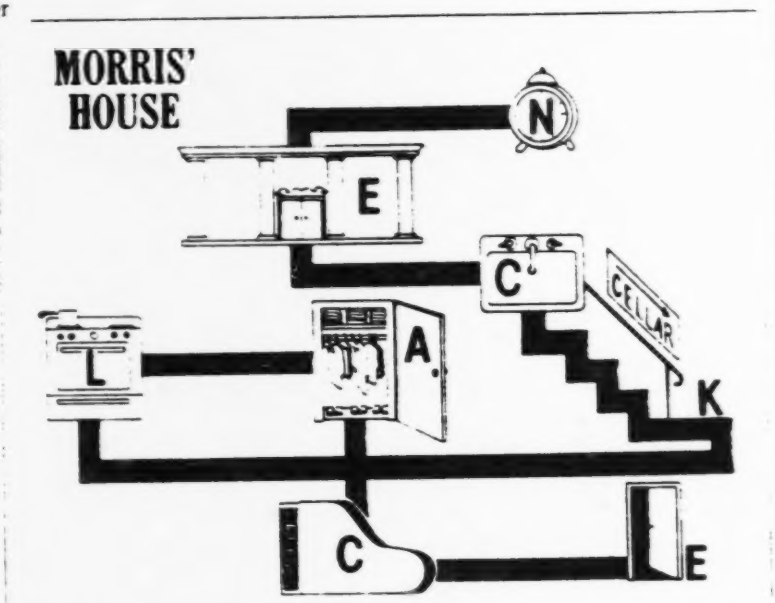
Cut out and laminate Student Task Card 2.

Review cursor movement.

Demonstrate how the cursor can be moved through the HOUSE file.

Tell students that Chloris, one of Horace's two sisters, is convinced that there are more treasures to be found in the Moneybucks' mansion. It is their job in this activity to help her locate them.

Activity: Make sure the cursor is at the START position on the transparency of Morris' house. Then have students follow the directions on Activity Card 2. They are asked to "revisit" the house locations that Horace explored in Activity 1. At each stop on their journey they will find a single letter. Tell them to keep track of all eight letters that they come to. The eight letters together spell the name of an additional treasure that Horace overlooked. *(A necklace.)*



Make a transparency of Morris' house — the site of many hidden treasures.

ACTIVITY 3:

TWICE-TYPED TEXT

Word Processing Skill: Text deletion.

Language Arts Skill: Determining correct spelling of words in a passage.

Materials: The text file DOUBLE and Student Task Card 3.

Preparation: Using your word processing program, type the following file into the computer. (Be sure to include misspellings.) Save the file on a blank disk or cassette under the name DOUBLE.

FILE: DOUBLE

My dear Maax,

My childreen, as you may rememmber, are a bitt selfish. I know they will be angry iff you receive too many items from my estaate. I am writing this letter, therefore, to tell you off things thhat I have hidden foor you in thee attic.

Among the thinngs I have saved forr you are my bowlling ball, the enturre soda bottle collection, twellve beetle boxxes, and my green books.

Be certain to remoove the items whhen Doris, Horace and Chlonss are not loooking. Don't get caaught!! Sincerely, Morris Q. Moneybucks

Show children how to delete text on the video screen. Then show them how to save a data file on a blank disk or cassette.

Cut out and laminate Student Task Card 3.

Activity: Tell students to call up the DOUBLE file and follow the instructions on Student Task Card 3. The card tells them to delete all the extra letters they find in the words in the DOUBLE text. Have kids make a printout of their work and then save it on a disk or cassette.

ACTIVITY 4:

TOO SHORT FOR WORDS

Word Processing Skills: Text insertion and replacement.

Language Arts Skill: Determining word meaning through context.

Materials: TELEGRAM text file and Student Task Card 4.

Preparation: Using your word processing program, type the following file into the computer. Save the file on a blank disk or cassette under the name TELEGRAM.

FILE: TELEGRAM

DEAR MAX.

I M VERY SAD 2 HEAR ABOUT MORRIS. I M ON MY WAY TO D MANSION. MY CAR BROKE DOWN. I L B A LITTLE LATE.

PLEASE COLLECT MY THINGS SO HORACE N CHLORIS DO NOT TAKE M. I M BRINGING MY DELICIOUS BROWNIES 2 U. (NO LOOT. NO BROWNIES).

R U GOING SHOPPING TODAY? Y DON'T U HAVE A BONE READY 4 WALDO WHEN WE ARRIVE? HE WOULD LOVE 1.

SINCERELY,
DORIS

Show students how to insert and replace words in an existing text file.

Cut out and laminate Student Task Card 4.

Activity: Tell students to call up the TELEGRAM file and follow the instructions on Student Task Card 4. The card tells them to replace all the shortened word symbols they find in the TELEGRAM file with correctly spelled words. For example, "sad 2 hear . . . " should be replaced with "sad to hear . . ." and "I L B A little late" should be replaced with "I will be a little late."

When they're finished, have students make a printout of their work and exchange it with a neighbor to check spelling. Then save the work on a disk or cassette.

INVITING ACTIVITIES AND MORE

Word Processing Skills: Text creation, plus additional practice with the four word processing skills previously introduced.

Language Arts Skills: Letter composition, following directions.

Materials: INVITE text file and Student Task Cards 5, 6, 7, and 8.

Preparation: Using a word processing program, type the following file into the computer. Save it under the name INVITE.

FILE: INVITE

Doris Moneybucks
and Wilbur Weedwacker
cordially invite you
to their wedding.
PLACE: _____
ADDRESS: _____
_____
DATE: _____
TIME: _____
RECEPTION: _____

Kindly RSVP (that's French for "let us know if you can make it").

Cut out and laminate Student Task Cards 5–8.

Activity: Have students call up the INVITE file and complete Student Task Cards 5–8, in order. In cards 5 and 6, kids are asked to insert and change information on the wedding invitation found in the INVITE file. In cards 7 and 8, students are instructed to write original letters to Doris taking the roles of Horace and Chloris, respectively.

For each activity, students make a printout of their work and then save it under a file name of their choice.

Thomas E. Boudrot is a computer coordinator for instruction in the Alief Independent School District in Alief, TX. He is also the author of *Byte-Sized Activities: The Generic Word Processing Activity Book* (Scott, Foresman and Company; 1985).

TASK CARD 1
Hidden Prize

When Horace arrived at the mansion of his father, the late M.Q. Moneybucks, he found a note. It was written in poetic form.

Horace isn't too smart. See if you can help him follow the instructions on the note.

1. Retrieve the file called NOTE. It will lead you to a second file. Plug in the letter that goes in the blank space on the second file and it will lead you to another file.

2. There are five files that work like this. Write down the missing letter in each file, put the letters together, and you'll find the file that tells what Morris left Horace.

3. You really deserve a part of the prize for helping out. Is it something that can be shared?

TASK CARD 2
House Hunt

Complete Task Card 1 before you try this card.

Chloris, the youngest Moneybucks, was furious that her brother Horace found the walrus tusks first.

Chloris decided to see if there was something else to steal . . . er, find in the house.

1. Call up the HOUSE file. Tape the maze transparency of Morris' house to the screen. Be sure that the periods on the screen are underneath the lines of the maze on the transparency.

2. Position the cursor at the word START, then move your cursor through the maze of the mansion and "revisit" (in order) the seven places that Horace visited in Activity 1: the clock, porch, sink, cellar, oven, closet, and piano. Write down letters you find along the way.

3. What do they spell? Could it be the family heirloom that Chloris has been searching for?

CUT OUT AND LAMINATE

TASK CARD 3
Twice-Typed Text

Complete Task Card 2 before you try this card.

Morris' faithful butler Max uncovered an unusual letter while cleaning. Call up the DOUBLE file and read it.

1. Sometimes the old electric typewriter that Morris used typed double letters where only a single letter belonged. Can you find examples of this in his note? Delete second letters wherever they do not belong.

2. Make a printout of your work. Then save it under a new file name so that you can call it up again if necessary.

TASK CARD 4
Too Short for Words

Complete Task Card 3 before you try this card.

Doris, the final inheritress of the Moneybucks fortune, lived in Washington, D.C., about 900 miles away from the mansion. When the bad news about Morris came, she packed her dog, Waldo, and her Siamese cats into her car (she was afraid to fly) and started out for the mansion. The journey went smoothly for the first mile or so. Then the car broke down.

Doris immediately sent a telegram to the butler, Max. (She was afraid of what her brother and sister might be up to without her.)

1. Call up the TELEGRAM file and read what Doris said to Max. Doris shortened many of the words in the telegram so that it would be cheaper for her to send. Change the shortened words that she used into correctly spelled words.

2. Make a printout of your work. Then save it under a file name of your choice.

TASK CARD 5
An Inviting Activity

Complete Task Card 4 before you try this card.

Doris surprised everyone: she decided to marry Wilbur, the man who repaired her car! After some thought, the couple decided it would be best to get married in Transylvania. (Wilbur is a castle buff.)

1. Call up the INVITE file. You will find the beginnings of a wedding invitation.
2. Complete the invitation to show the following information:
PLACE: Transylvania Castle
ADDRESS: 1313 Vampire Court, Transylvania
DATE: October 31, 1986
TIME: Midnight
RECEPTION: Pumpkin pie will be served.
3. Make a printout of your completed invitation. Also, save it under a file name of your choice.

TASK CARD 6
A Change of Plans

Complete Task Card 5 before you try this card.

After some thought, Doris and Wilbur decided that they didn't want to wait until Halloween to marry. It was too far off for them. They agreed that Valentine's Day would be a more appropriate holiday for a marriage, anyway. They decided to change some of the other wedding plans, too.

1. Call up your invitation file.
2. Change the invitation to show that the date is now February 14, 1986.
3. Change the note about the reception to read that guests should bring their own chocolates.
4. Add a personal note at the bottom of the invitation to Horace or Chloris.
5. Make a printout of the file. Save the file in case you need it later.

CUT OUT AND LAMINATE

TASK CARD 7
Saying No Gracefully

Complete Task Card 6 before you try this card.

"Attend Doris' wedding? Are you kidding? I never really cared for Doris. She was a very bossy big sister!"

1. Pretend that you are Horace. Write a letter to Doris to inform her that you will not attend the wedding in Transylvania.
2. In your letter, tell Doris about all the beautiful things she turned down when she didn't show up at the mansion, including the walrus tusks and the necklace.
3. Make a printout of your letter. Then save it under a special file name.

TASK CARD 8
"I Do" & "I Will"

Complete Task Card 7 before you try this card.

Chloris and Doris usually got along as children.

1. Pretend that you are Chloris. Write a letter to Doris to inform her that you *do* plan to attend the wedding. Be sure to tell her your airplane flight number as well as the day and time of your arrival in Transylvania.
2. While you're at it, a few questions about Wilbur are in order. Also, how about his family? Will they be attending? Are Waldo and the cats going to be there, too? Ask Doris for some more details about the big event.
3. Print out your letter. Save the file.

DATA BASE MANAGEMENT

DATABASE MANAGEMENT SYSTEMS

What is a database?

A database management program is like an electronic filing system. Database management programs are used in hundreds of different ways. For example-

- -Business people use them to store information about their customers.
- -School librarians use them to store information about the books they have in the library.
- -Airline companies use them to store information about flight reservations.
- -Police departments use them to store criminal records.
- -Adult Educators use them to keep track of their Adult Education students' enrollment, contact hours, GED scores, or pre/posttest scores.

The word 'data' simply means information. That information may be words or numbers or both. A 'base' is a starting point or central location or collection of stored information. A database management program is a computer program that manages (organizes, stores, and retrieves) data (or information).

There are many database management software applications currently on the market. They include:

AppleWorks	Apple Computer, Inc.	Apple II Series
File	Microsoft	Macintosh
The Consultant	Batteries Inc.	Commodore
Profile 4 Plus	Compusoft	Radio Shack
Data File Manager	Softbyte Computing	Radio Shack
Database 3	Holiday Software	IBM-PC, CP/M
PFS:Report	Software Publishing	Apple
PFS:File	Software Publishing	Apple, IBM
DB Master	Stoneware, Inc.	Apple
Condor I, III	Condor Computer Corp.	IBM, Apple
VisiFile	VisiCorp Software	IBM-PC
dBase II, III	Ashton-Tate	IBM, CP/M
Data Manager 2	TimeWorks	Commodore

What equipment will you need?

You will need a purchased software database program, and your basic computer. Most database software packages also require the use of a disk drive, and a printer. Since a database program must be able to instantly look at large amounts of information the use of a 'cassette' is not recommended. In fact, because of the huge quantity of information they carry, many database programs call for a minimum of two disk drives - one for the program itself, and the other drive reserved for the data disk.

You may be able to run a database without a printer, but you will lose much of what a database program can do for you. Besides being useful for hardcopy printouts of mailing lists, test scores, class lists, telephone numbers, you will also want a printer for those systems that can give you database information in the form of tables and charts.

What to look for in a database

Since a database is only as good as the way it arranges and sorts information, you should determine how well the program you want to use arranges and sorts the information you have entered. Can you sort through your information and pull out just the students that are at a certain age and of Hispanic origin? Can you arrange all the students in your class alphabetically? Other consideration should include the ease of data entry, ease of updating information, and program speed. Since a database system spends most of its time looking for information, the speed at which the program accesses and sorts data should be a prime concern. If you need to change addresses often does it take a long time to call up a students' name? Can you ask for any name, or do you have to sort through all the names? Another important area is exactly how much data can be stored in the database program. How many records? How many characters? What kind of printing options are available - can you print reports, or mailing labels? How helpful is the manual or program itself? Some programs have 'help' notations while you're working on the database program. Finally, database programs range from under $100 to well over $500. So, you need to decided what you can afford.

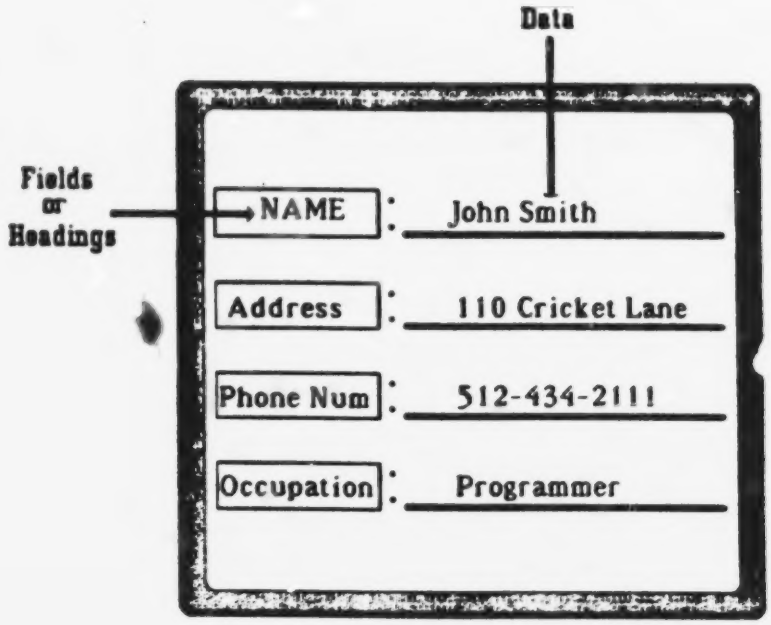
How a database works

A data-base management program generally consists of two main parts: (1) a form with blanks which you fill with information about each member of the database (a group of people, enrollment, addresses, sex, age): and (2) a routine for sorting the information into categories, and printing the resulting list or report.

For example.....Using a database program, you can keep track of the students currently enrolled in a GED class. The information you enter into the computer is organized into fields, records, and files.

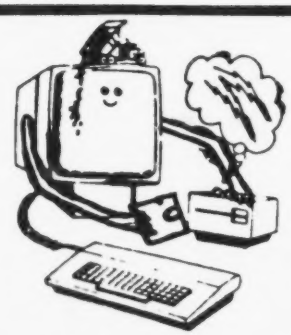
Fields- Different categories or items of information are called fields. (Some programs call them variables) The space for a students' name would be a field. The space for the students' sex, or age would be a field.

Records - A record is a collection or listing of related fields. The data or information that you enter into the computer on one person (their name, age, address, sex, GED score) is called a record.



Files - The word <u>file</u> refers to a collection of related records. All of the student records make up one file. A file may consist of dozens, hundreds, or even thousands of records. All of the students in a GED class would make up a file. We would probably call our file "GED Class".

LOAD THE FILING SYSTEM



When you load your database program into your computer the first thing you see is the Database Menu. A typical menu looks like this:

Database Menu

1. Develop Format
2. Add Records
3. Search Records
4. Print

1. Develop Format

To develop a format press "1" on your computer keyboard, and then press the enter or return key. The program may ask you to name your file. For our example, it will be called "CLASS", since we're keeping track of the students in the GED class.

Based on what information you want to know about the class, you must develop a blank format or outline of the fields you want in each students' record. The number of fields you can have in your format depends on the sophistication of your database program.

CLASS

Name
Address
Sex
Ethnic
Age
Total Hours

2. Add Records

Once you have created the format you then need to add the information needed for each student. Your program will return you to your format starting with the name of student #1. After you type in all the information for student #1, the program automatically goes to student #2. You type in all the information until you have finished with the GED class.

In some database programs it is easier for the computer to retrieve information if they are in codes. For example sex would be coded as '1' for male and '2' for female.

CLASS

Student #1
Name: Jose Castro
Address: 321 Bird
Sex: Male
Ethnic: Hispanic
Age: 25
Total Hours: 39
Student #2
Name: Connie Jones
Address: 105 East
Sex: Female
Ethnic: White
Age: 41
Total Hours: 98

SEARCH

3. Search Records

Once you have all the records stored in a file, your database program will let you search that file many different ways. You might ask the computer to search for all the males in the class, or the students who came to class more than 35 hours.

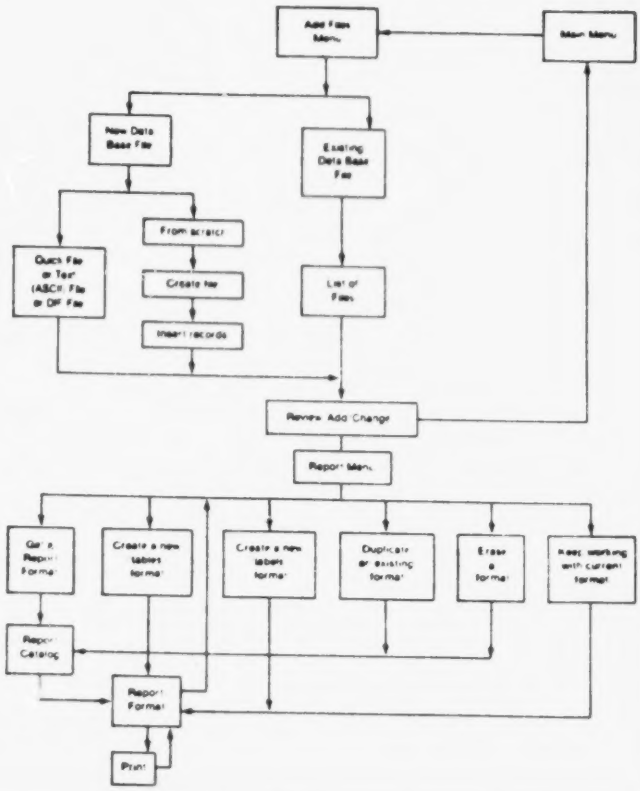
In addition to searching for different records most programs will arrange your records in alphabeltical or numerical order. This is called sorting. Some can also sort data into categories and subcategories and present the information in the form of an organized list or table.

4. Print

Every database management program includes an option for printing the records of any file. You can print out just the information for student #1, all the names of the males in the GED class, or all the students you were in class every day. If you want to mail newsletters to the students in the GED class you can tell the computer just to print mailing labels with the name and address.

What else?

In most database programs there are many more menus and options to pick from than those mentioned above. This flowchart shows the options and menus that are available in the AppleWorks database program.



GUIDELINES FOR USING A DATABASE SYSTEM

● Creating the Format:

-When storing names, create separate fields for first and last names.
-Be certain to allow enough space for data in each field.
-Create a "miscellaneous field" (dummy) to allow expansion.
-Make the first field the one you will likely search or sort on most often.
-Create fields in the order you will most likely use in printing hardcopy. (i.e., mailing labels are usually printed with name, street address, and city/state.)
-Plan for adequate expansion room on each disk.
-Name the data disks so that they let you know what kind of data is stored on that disk.
-Select field names that are meaningful.

● Inputting the Data:

-Spell correctly and consistently.
-Decide ahead of time whether data should be stored as numeric or alpha-numeric. Be consistent. Don't use both forms. (i.e., use June 6, 1986, or 06/06/1986)
-Don't use commas in large numbers if you intend to sort on that field. (Many programs won't include in the sort what comes after a comma . This includes names and numbers.)

● Maintaining the Data File:

-Frequently make backups of data disks.
-Purge needless records form your data-file. (Delete them)
-Gain skills needed to add, delete, and modify information in fields.
-If data disks become full, use copy utilities to split files into 2 or more disks.
-Create and store frequently using printing formats.
-When necessary, use utilities (or menus) to modify your data-file format.
-When necessary, use utilities (or menus) to merge data-files.

DATABASE PROGRAM

Each of the following definitions below have something to do with a database program. Match the letter with its definition.

_____1. A list of tasks that a program can do.

_____2. A central location for related information.

_____3. A collection of related records.

_____4. Different categories or items of information. Sometimes called variables.

_____5. Being able to go through all your information and retrieving that information by certain specifications.

a. sorting/searching
b. database
c. menu
d. fields
e. file

1.c, 2.b, 3.e, 4.d, 5.a

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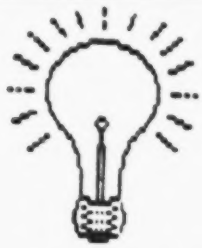
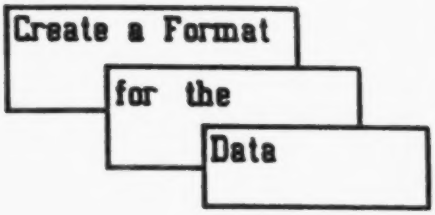


ACTIVITIES FOR USING A DATABASE SYSTEM

Activity #1 Creating a format for the database

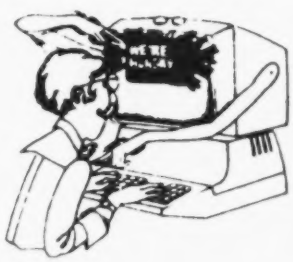
Suppose you want to keep a file of the 10 students in your GED class. Using your database program create a format for this file (database) which includes field headings for the following:

- -Last name
- -First name
- -Street address
- -City
- -State
- -Zip code
- -Sex
- -Ethnicity
- -Age
- -GED Math Score
- -GED Reading Score
- -Total Hours Attended

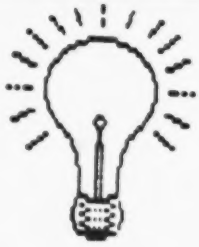


Activity #2 Inputting data

Type in the information for each field for 10 students. Each student's information represents one record. You will probably need to go to the menu and ask to add new records, or update information.



Did you name your file "CLASS"?

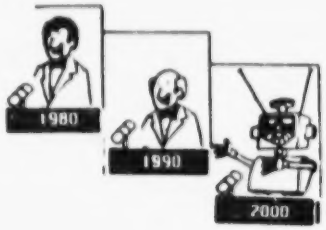


UPDATE FILES

Activity #3 Updating the file

Since you first put in the information some changes have been made. Make the needed changes in your database.

-Two of the students have changed their addresses.
-One student retook the GED math test and got a higher grade.
-One student retook the GED reading test and got a lower grade.
-One student had a birthday, change the age.
-One student forgot to sign in on one day and you didn't give them credit for 5 hours of instruction.

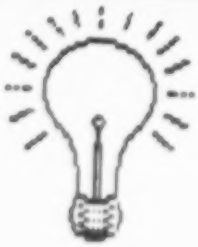


Activity #4 Retrieving/searching the file

Using the specific menu or utility on your database program search your database for the following.

-All students with the same last name.
-All students that are male.
-All students that scored below 30 on the GED math test.
-All students living in your city.
-All students scoring above 35 on the GED reading test.

RETRIEVE



Activity #5 Sorting your file

Using the menu and/or utility on your database, correctly go through the steps to sort your database to obtain a list of the students in the GED class in the following order.

- -alphabetically by last name
- -from youngest to oldest (by age)
- -by zip code order
- -by those males that are also under age 30
- -by the least to most hours attended
- -with a ranking (lowest to highest) for math scores
- -lowest to highest reading scores

Activity #6 Removing information from your file

The following information is no longer needed. Remove it from your file.

- -One student got married and left class. You now have 9 students.
- -One student wants to be called just by their first name.
- -One student moved to a new address but won't give you the new address
- -One student doesn't want anyone to know their ethnic background
- -One student told you they really hadn't taken the GED reading test

Activity #7 Printing information from your file

You need the following information from your database to show your supervisor.

- -Print a list of all the students who have passed their GED reading test.
- -Print a list of all the students who have passed their GED math test.
- -Print a list of all your students in the GED class. Include their addresses, age, sex, and ethnicity.

HOW TO SET UP A SOCIAL STUDIES DATA FILE ON U.S. PRESIDENTS

DATA BASE PRIMER

A data base management program is like an electronic filing cabinet or a computerized index-card box. It is a piece of software that lets you organize, store, and retrieve information.

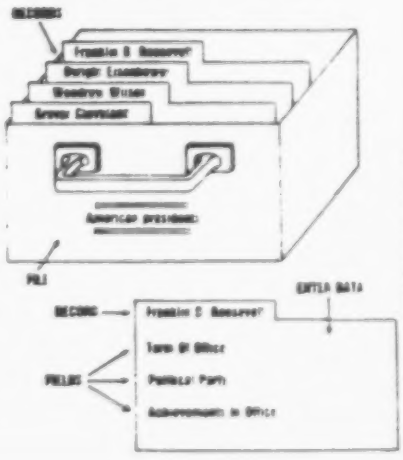
All data management programs contain three important elements: fields, records, and files.

1. Field: A field is a category or item of information. For example, in the U.S. presidents data file in this feature, TERM OF OFFICE, POLITICAL PARTY, and ACHIEVEMENTS IN OFFICE are fields.

2. Record: A record is a collection or listing of related fields. In the U.S. presidents data file, the information in the fields TERM OF OFFICE, POLITICAL PARTY, and ACHIEVEMENTS IN OFFICE for Franklin D. Roosevelt would be in one record. The TERM OF OFFICE, POLITICAL PARTY, and ACHIEVEMENTS IN OFFICE for Woodrow Wilson would make up another record.

3. File: A file is a collection of related records. The record for Franklin D. Roosevelt, the record for Woodrow Wilson, and records for the 38 other U.S. presidents would make up a file.

PARTS OF A DATA BASE



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DESIGNING A DATA FILE

When creating a data file, the first thing you must do is to develop a structural design that each data record will follow. The worksheet shows a sample design for a record on a U.S. president. When transferred to the computer, this record should fill three screens. This allows students enough space to enter detailed political and personal information about a president, and to list the sources from which the information was taken.

Feel free to tailor the file design to suit your curriculum needs and the make-up of your particular data management program. Then make at least one copy of the worksheet for each of your students.

DISCUSSING TERMS IN THE FILE

Before students begin gathering information for the file, they need to be given a standard format for filling in the fields for each record. (If you have used a computerized data file, you know how difficult it is to retrieve data if it has not been spelled correctly and input in a similar way.)

Write the names of your fields on the chalkboard. As a class, discuss standard formats to use for recording data in each. Following is how your class could record data for fields in the first screen of the sample record on page 14.

NAME. The format for filling in a president's name is last name, then first name.

KNOWN POPULARLY AS. Students fill in this field with a popular nickname for the president, such as "Teddy" for Theodore Roosevelt, or with a popular phrase, such as "First in war, first in peace, first in the hearts of his countrymen" for George Washington.

TERM OF OFFICE. Students should fill in two years for each president: the year the president first served and the year he left the office. For example, President Jimmy Carter's term would be filled in this way: FROM 1976 TO 1980.

HOW BECAME PRES. The usual way a person becomes president is by winning a presidential election that is conducted every four years. To win a presidential election, one must acquire a majority of electoral votes (winning the popular vote is not enough). If no candidate for president wins a majority of the electoral votes, the U.S. House of Representatives elects the president. Two presidents, Thomas Jefferson (in 1801) and John Quincy Adams (in 1825), entered the oval office this way. Also, some vice presidents became president when a president died in office, resigned, was removed from office, or for some other reason could not fulfill the duties of the presidency. Nine vice presidents became president in such ways. As a class, agree on standard terms to describe how each president came into office (e.g., Electoral College, House of Reps, Filled Death Vacancy).

POLITICAL PARTY. Discuss the history and ideology of the various political parties students will encounter in their research. Important U.S. political parties include the Federalist, Anti-Federalist, Democratic-Republican, National Republican, Democratic, Whig, Republican, Greenback, Populist, Progressive, and American parties. (Check encyclopedias for more information on these parties.) Students should agree on a standard term for each party, such as "Democrat" rather than "Democrat."

ACHIEVEMENTS IN OFFICE. For each president, students should choose the achievements which were the most important and compose a short summary on them, something that will fit the available space. Here's a sample summary of John F. Kennedy's achievements: "Created Peace Corps; ordered naval blockade of Cuba during Missile Crisis; ordered end to racial discrimination in federally-subsidized housing."

EVENTS DURING ADMINISTRATION. Students should compose a short summary of the most important U.S. events that took place during the president's administration. For example, during Lyndon B. Johnson's administration, the following important events took place: "Gulf of Tonkin incident (beginning of Vietnam War); first walk in space; Vietcong Tet offensive; assassinations of Martin Luther King, Jr. and Robert Kennedy; riots outside Democratic convention."

PREPARING STUDENTS FOR RESEARCH

Divide the class into pairs of students, and assign each pair the responsibility of gathering the record data for at least one president. (Make sure all 40 presidents are assigned.)

Arrange for students to go to the school library to use reference sources, or provide sources in the classroom. (Helpful reference materials include encyclopedias, the *Dictionary of American Biography*, and biographies of American presidents.) Students also may find valuable information in county libraries, local museums, and college libraries.

Before having students gather data, work with them to fill in one sample form. (See sample record on George Washington, at left.)

Explain to students that they may not always be able to fill in all of the fields on the form for every president. For example, there are some presidents who do not have a nickname or a quote about them that could be inserted in the KNOWN FOR LARGELY AS field.

GATHERING AND ENTERING DATA

Now students are ready to begin research. Distribute copies of the worksheet on page 17. Tell students to use their reference materials to fill in the worksheets. At the bottom of each worksheet, under REFERENCE, students should jot down the titles of the sources (and the page numbers) they used to get their information.

Once students have filled in at least one form, have them exchange forms and check them for accuracy. To check a form, students should look up the information in the books listed on the worksheet under REFERENCE. They should check for factual accuracy as well as correct spelling and abbreviation, and make corrections as needed.

Have students check the format of the data also. For example, are the dates for TERM OF OFFICE written in the correct format? If an incorrect format is spotted, students should make amendments accordingly.

Students should examine carefully the ACHIEVEMENTS IN OFFICE and EVENTS DURING ADMINISTRATION data items. If students don't think that the achievements and events listed on the data form are the most important ones to put in the file, they should discuss other possibilities with the classmates who wrote the data.

Once forms have been checked, students can take turns entering the data into the computer. For this task, it's best for students to enter data from forms that they themselves did not fill in or check. One person should type while a partner reads the instructions and data. Each partner should check the data for accuracy.

USING THE FILE

Your students have now created a file of data about the presidents that can help them study a variety of questions, such as:

- Which presidents came into office without being elected?
- What are the most common previous occupations of American presidents?
- What state has produced the greatest number of presidents?
- Which president served the longest term in office?
- Is there any relationship between length of term in office and the achievements made by a president?
- Is there any relationship between length of term in office and whether the country was at war?
- Which first ladies made important contributions to our country?

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- Looking at Republican presidents as a group and Democratic presidents as a group, are there any major differences in the groups' achievements?
- Did most presidents hold a political office prior to becoming president?
- Which presidents were most effective?

Have each student choose one of the previous questions or define a different question on the presidents and use the data file to produce a printout that is useful in answering the question.

Most data management programs have a function that allows students to print lists of specially selected information from their record file. Teach students how to use your data management software to retrieve specific information. For example, with the *Scholastic pts! file* program, students fill in a "Print Spec" form that tells the computer which fields to print from each record. For example, if the question examines the relationship between various presidents' political parties and achievements in office, they probably would want to print the data listed in the NAME, POLITICAL PARTY, and ACHIEVEMENTS IN OFFICE fields only.

Students also use the Print Spec form to tell the computer how to organize the records before printing the list. For example, if students are looking at the presidents' political parties and achievements, they might want to sort the forms so that all the presidents for one party would be grouped together. The box at right shows a sample report that has been sorted by political party.

Students must also decide which presidents to include in their printout (all or a specific group of presidents). With the *Scholastic pts! file* program, students fill in a form called the "Retrieve Spec" that allows them to specify the criteria for selecting which presidents to print forms for.

Once students have their printout, they can use it to answer their question. Sometimes the printout provides more information than students need. If that happens, tell students to circle the information on the printout that is directly related to their question and then use that information to draw their conclusions.

To answer some questions completely, students may need to get several different printouts and make lists from these printouts. For example, to answer the question, "Is there any relationship between length of term in office and whether the country was at war?" students may choose to sort one printout by TERM OF OFFICE. From the printout, students make a list of presidents that served the longest terms (headed by Franklin D. Roosevelt, who was elected four times) and another list of presidents that served the shortest terms (headed by William H. Harrison who died a month after his inauguration). Then they compare those lists with a printout of presidents in office during wars.

In some cases, the data in the file can only give part of the answer to students' questions. They may need to look up additional information in the library. For example, to answer the question, "Which presidents were most effective?" students may need to consult critical biographies and political editorials published in newspapers and magazines.

It might be fun to tape everyone's printout on the wall for a couple of days, so all students will have a chance to study the data. Have students discuss with their classmates what they learned from their printouts. Also ask them to write up their findings and report them to the class.

ADDITIONAL ACTIVITIES

Here are some class projects students can do using data from their files.

- Conduct a panel discussion on the topic, "How to Prepare to Become a United States President." To prepare for the discussion, have student panelists examine file printouts that show the education, political party, previous occupations, and previous experience of U.S. presidents. Note how many presidents were politicians, lawyers, and bankers.

• Make a bulletin board display of the U.S. presidents. At the top of the board, tack paper letters that read "Hail to the Chiefs!" Use your data file to prepare special printouts that illustrate interesting collections of data about certain presidents, such as all the presidents born in Ohio, all the presidents who didn't attend college, or all the presidents who were former teachers. Tack these printouts and students' sketches of favorite presidents throughout the board.

• Role-play the presidents. Have each student select a president and use information from the file to prepare a hypothetical speech the president might give to the American people of his time. For example, President Coolidge may talk about Charles Lindbergh's flight across the Atlantic; while President Lincoln would probably address the issue of slavery. Students will find information in the ACHIEVEMENTS IN OFFICE and EVENTS DURING ADMINISTRATION fields particularly helpful in writing their speeches. They also may need to consult additional sources, such as newspaper and magazine articles from the time period, to make their speeches historically accurate.

Have students take turns presenting their speeches to the class, without telling classmates which president they are. Encourage students to incorporate physical clues, such as military attire for President Grant or cowboy boots for President Reagan, into their role-playing. The other students try to guess which president their classmates are "playing."

• Write a "help wanted" advertisement for the job of U.S. president in the year 2000. What kind of qualifications do kids think the future president should have? What past experiences would be helpful? What previous occupations? Compare these qualifications to those needed in a president during the early 1800s.

Beverly Hunter is the developer of a series of data management instructional packages for social studies, science, and language arts called *Scholastic pts. Curriculum Data Bases*. Material for this article came from the package titled *Scholastic pts. U.S. History Data Bases*. ***Dr. Mary Furlong*** is co-author of *Scholastic pts. U.S. History Data Bases*. She is also associate professor in the Department of Education at the University of San Francisco.

AMERICAN PRESIDENTS

NAME: Washington, George
KNOWN POPULARLY AS: "First in war, first in peace, first in the hearts of his countrymen."
TERM OF OFFICE
FROM: 1789 TO: 1797
HOW BECAME PRES.?: Electoral College
POLITICAL PARTY: None
ACHIEVEMENTS IN OFFICE: Set an example for future presidents; two terms; created the first Cabinet (department heads); put down Whiskey Rebellion; signed the Jay Treaty
EVENTS DURING ADMINISTRATION: Clashes between Alexander Hamilton (Sec. of Treasury) and Thomas Jefferson (Sec. of State) cause formation of first political parties; French Revolution

PERSONAL DATA
NAME: George Washington
BORN: 1732 DIED: 1799
BIRTHPLACE: Westmoreland County, VA
EDUCATION: Finished schooling at age 15
PREVIOUS OCCUPATION(S): Surveyor
PREVIOUS EXPERIENCE: Fought in French and Indian War; Commander of Continental Army
NAME OF "FIRST LADY": Martha Custis
HER CONTRIBUTIONS: Traveled long distances during the Revolutionary War to share her husband's hardships; organized a women's sewing circle to mend clothes for the troops

REFERENCES
Webster's American Biographies 1979, pp. 1097-1099
The World Book Encyclopedia 1985, pp. 85-86

A sample record on George Washington.

POLITICAL PARTIES OF THE PRESIDENTS

Cleveland, Grover (second term) Democratic
Wilson, Woodrow Democratic
Carter, James E. Democratic
Johnson, Lyndon B. Democratic
Kennedy, John F. Democratic
Truman, Harry S. Democratic
Roosevelt, Franklin D. Democratic
Cleveland, Grover Democratic
Buchanan, James Democratic
Pierce, Franklin Democratic
Polk, James K. Democratic
Van Buren, Martin Democratic
Jackson, Andrew Democratic
Adams, John Quincy Democratic-Republican
Monroe, James Democratic-Republican
Madison, James Democratic-Republican
Jefferson, Thomas Democratic-Republican
Adams, John Federalist
Johnson, Andrew National Union
Washington, George None
Harrison, Benjamin Republican
Reagan, Ronald W. Republican
Ford, Gerald R. Republican
Nixon, Richard M. Republican
Eisenhower, Dwight D. Republican
Hoover, Herbert C. Republican
Coolidge, Calvin Republican
Harding, Warren G. Republican
Taft, William H. Republican
Roosevelt, Theodore Republican
McKinley, William Republican
Arthur, Chester A. Republican
Garfield, James A. Republican
Hayes, Rutherford B. Republican
Grant, Ulysses S. Republican
Lincoln, Abraham Republican
Fillmore, Millard Whig
Taylor, Zachary Whig
Tyler, John Whig
Harrison, William H. Whig

This sample data report, printed with Scholastic pis file, sorts the presidents by their political parties.

BEST COPY AVAILABLE

COPY

YOUR NAME: _____

AMERICAN PRESIDENTS DATA RECORD

DIRECTIONS: Use a reference book to find information about a U.S. president, and write it in the spaces provided below.

NAME: _____

KNOWN POPULARLY AS: _____

TERM OF OFFICE

FROM: _____ TO: _____

HOW BECAME PRES.? _____

POLITICAL PARTY: _____

ACHIEVEMENTS IN OFFICE: _____

_____

_____

EVENTS DURING ADMINISTRATION:

_____

_____

PERSONAL DATA

NAME: _____

BORN: _____ DIED: _____

BIRTHPLACE: _____

EDUCATION: _____

PREVIOUS OCCUPATION(S): _____

PREVIOUS EXPERIENCE:

_____

_____

NAME OF "FIRST LADY": _____

HER CONTRIBUTIONS: _____

_____

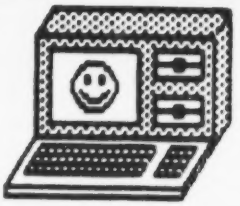
_____

REFERENCES

_____

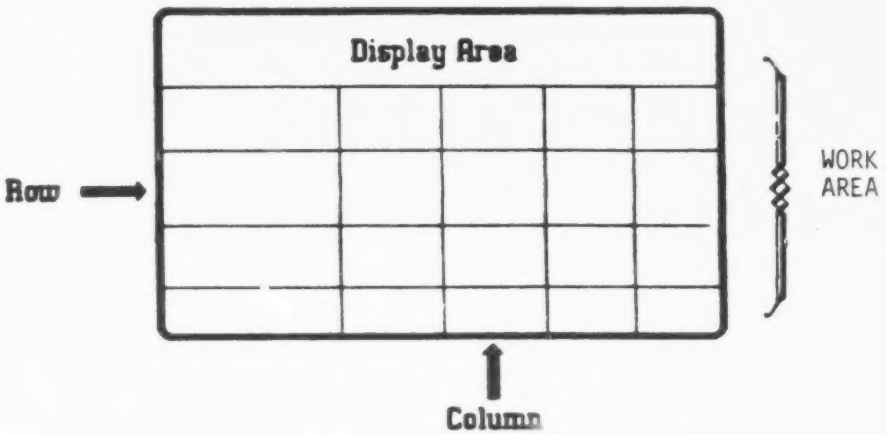
_____

SPREADSHEETS



ELECTRONIC SPREADSHEETS

An electronic spreadsheet is like a very large piece of accounting paper, with rows, columns, a work area, and a display area. Columns are usually made-up of letters, and rows by numbers.



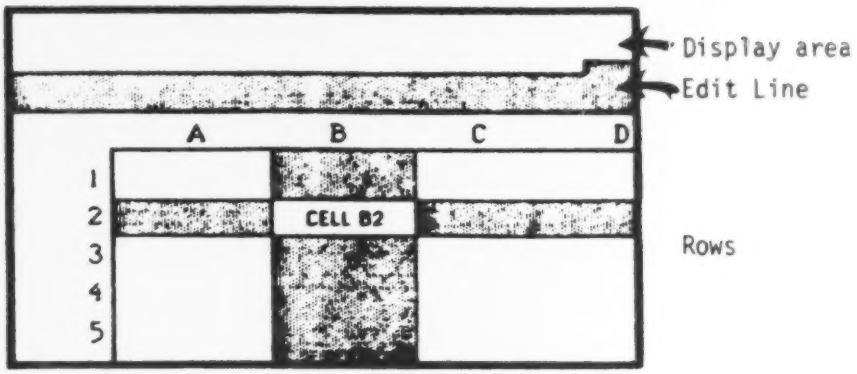
Spreadsheets can be used to:

- store data (usually numbers) and display them either by rows or columns.
- predict outcomes based on what data or numbers we put in and the kind of formulas we use.
- perform calculations on the rows or columns of numeric data.

The spreadsheet remembers formulas and calculations, and whenever you insert new numbers, change old numbers, or even wonder what would happen if you used different numbers, the spreadsheet will recalculate the entire worksheet.

PARTS OF THE SPREADSHEET

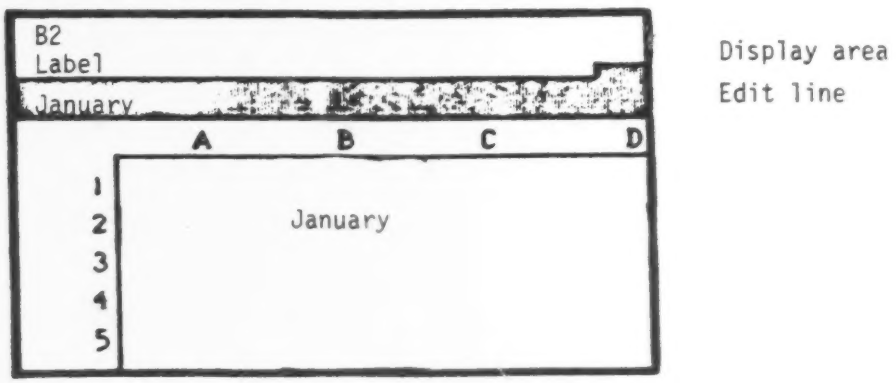
Rows and columns intercept to form cells.



Cells are named first by the column it intercepts, and then by the row number. The coordinates of this cell are B and 2 or B2.

A cell can contain a value, a formula, or a label. In a spreadsheet program, words are called labels; numbers and formulas are called values.

The display area tells uou where the cursor is, and whether the cell where the cursor is, contains a label, value or formula. The edit line tells you what is inside the cell where the cursor is currently located.



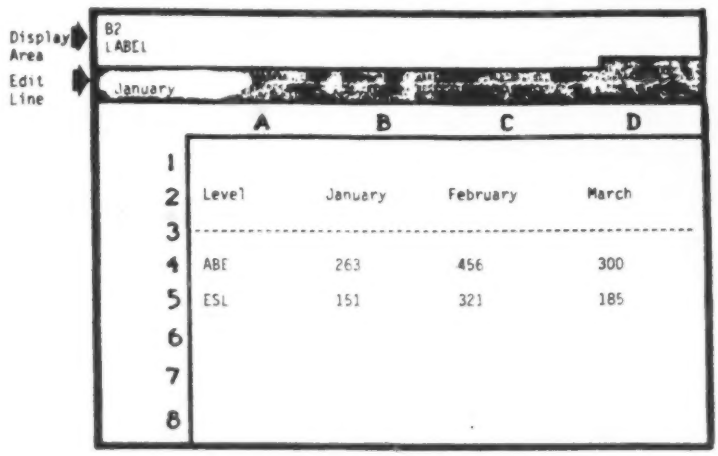
This spreadsheet indicates that inside cell B2 is a label which is called January.

You can move the cursor one cell at a time along a row (horizontally), or up and down a column (vertically). You can also move the cursor from one cell on the worksheet to any other cell in one jump (direct

move) depending on the software program you have.

You can label your rows and columns with words, numbers, or symbols. Labels can be placed anywhere in the worksheet.

On the spreadsheet below, we have words (level, ABE, ESL), numbers (263, 456, 300, 151, 321, 185), and symbols (---------). The display area indicates the cursor is in cell B2 which is a label. The edit line indicates the contents of B2 is the month January.



If the cursor was at cell C4, the display area (cell indicator) would show C4,(that it was a value,) and the edit line would show 456.

The column width can be changed. All the columns do not have to be the same size. For example student names can be in column A (and have 15 to 20 characters), and contact hours (about 3 characters) can be in columns B, C, and D.

The spreadsheet software program you are using dictates how many rows and columns you can use. Some of the new spreadsheets print sideways on the printer giving you more area to display the columns.

If we want to add or subtract (or multiply or divide) the numbers we have in the columns we need to place formulas into the cells. Formulas are used to ask "what if" questions. The formula symbols are the same as those used in Basic language.

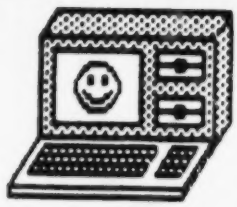
Addition	+
Subtraction	-
Multiplication	*
Division	/

Functions are codes that stand for a common or complex calculation. When you type a function into a cell, you are calling for a special formula that operates on cells you specify or values you supply. All functions start with the @ sign (the 'at' sign) and an abbreviation that stands for the function, such as @SUM. A function command tells the computer to perform some kind of calculation, such as adding a series of numbers, or finding the average of those numbers. Functions can perform more complex calculations than simple addition, subtraction, multiplication, or division such as averaging. Spreadsheet programs may differ in how the computer enters formulas.

Depending on the spreadsheet you are using, you may have commands or options on your spreadsheet such as:

blank	format	column
clear	integer	insert
zap	deleate	left-aligned
move	edit	right-aligned
print	store	save
load	quit	review
add	change	copy

Some spreadsheets have a function called 'standard values'. Spreadsheet standard values specify how information in the spreadsheet will be displayed. Spreadsheet standard values tell, for example, whether labels are left justified, right justified, or centered in cells. They also tell how many decimal places values should have, or whether they should have dollar or percent signs.



WHAT IF you were planning to buy a computer, but you needed to work a certain number of hours before you had enough money to buy the computer.

	A	B	C	D
1	$RATE	$5.00		
2	#Hours	35		
3	----------			
4	PAYCHECK	$175		
5	Comp Cost	$200		
6	----------			
7	NEED	$ 25		
8				

Cell B1 shows how much you make in your job.
Cell B2 shows how many hours you worked this month.
Cell B4 shows how much money you will receive in your paycheck.
Cell B5 shows how much the computer costs.
Cell B7 shows how much money you still need to get the computer.

There is a formula in cell B4. The formula needs to indicate that in order to find out how much money you will receive in your paycheck the computer needs to multiply (*) the hourly rate (B1) by the number of hours you have worked (B2). Depending on the spreadsheet program you are using the formula probably looks like this..

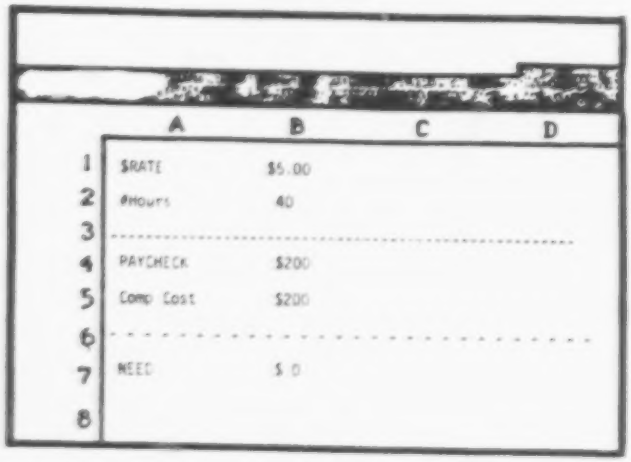
+B1*B2

The formula in cell B7 needs to tell the computer that depending on the amount of the paycheck, deduct (-) it from the cost of the computer (B5). The formula should look like this .....

+B5-B4

WHAT IF you worked 40 hours instead of 35 hours this month. All you need to do is move your cursor to cell B2 and change the 35 to 40.

The spreadsheet then recalculates all the numbers to let you know how much money you would make if you worked 40 hours, and how much money you would now need to buy the computer.



	A	B	C	D
1	$RATE	$5.00		
2	#Hours	40		
3				
4	PAYCHECK	$200		
5	Comp Cost	$200		
6				
7	NEED	$ 0		
8				

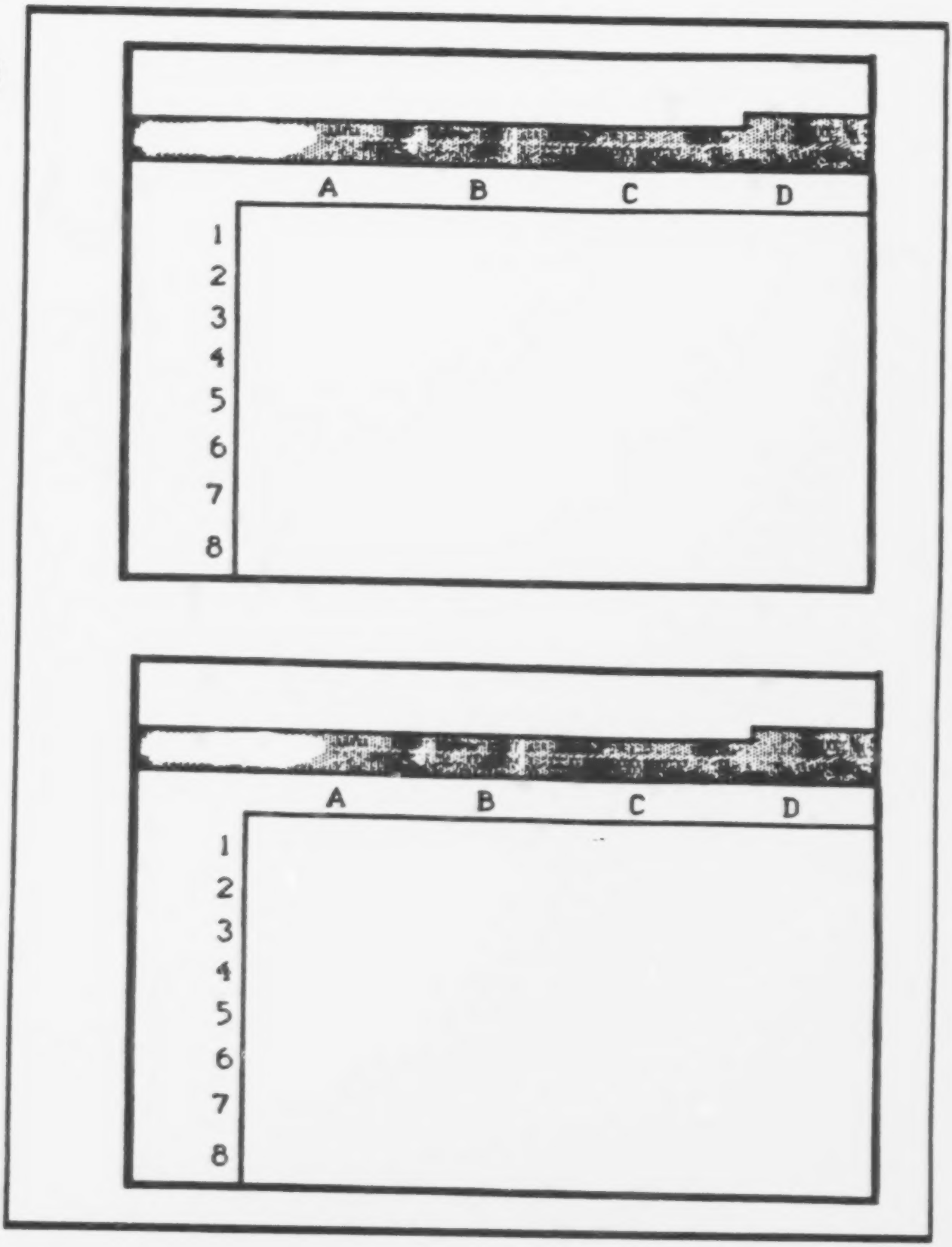
SPREADSHEET ACTIVITIES

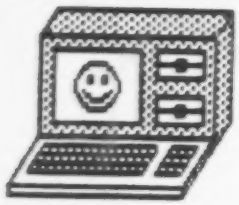
Using the software spreadsheet program you have for your computer can you do the following activities?

- Practice moving your cursor from cell to cell. Begin in A1 and move to A5, A6.
- If your spreadsheet program has a function or command like "GOTO", move from A1 to C7; from D5 to E8; from B3 to B8.
- Type the following labels in the cells indicated. If you do not have a computer write in on the blank spreadsheet where the labels would go.

  Type in cell A2 ABE
  A3 ESL
  A4 GED
  A5 ---
  A6 Total Enroll
  B1 Jan
  C1 Feb
  D1 Total Hours

- Type in the amount of hours of instruction for ABE, ESL, GED during the months of January and February. (Whatever you want)
- Using the commands or functions that your spreadsheet program specifies type in a formula in cell B6 indicating the sum of B2, B3, and B4. Type in a formula in cell D2 that indicates to the computer to add B2, and B3 together. Do the same thing for cells C6, D6, D3, D4, and D6. Some spreadsheet programs have a 'copy' function that lets you do this at the same time if the formulas are the same. (Replicate command)
- Now change the ESL hours for February and the GED hours for January. Did cells B6, C6, D3, D4, D5, and D6 change? Did cell D2 change?
- Use the PRINT command on your spreadsheet program to print your worksheet.
- Use the SAVE command on your spreadsheet program to save your worksheet to a data disk.


A
B
C
D
1
2
3
4
5
6
7
8
A
B
C
D
1
2
3
4
5
6
7
8



ELECTRONIC SPREADSHEET SOFTWARE

PFS: plan		
SwiftCalc	Timeworks	Commodore
Lotus 1-2-3		
Framework		
Practi Calc		
Visi Calc		
Calc Result	Handic Software	Commodore
Educalc	Grolier	Apple, Commodore, IBM

BASIC PROGRAMMING

ESSENTIAL ELEMENT IV

COMMUNICATING INSTRUCTIONS TO THE COMPUTER

A. Learn the syntax of a higher level language (BASIC, LOGO, and Pascal):

1. Identify the valid forms for constants, variables, and operation symbols used in standard BASIC.
2. Differentiate between numeric and string variables in BASIC.
3. Differentiate between commands and statements in BASIC.
4. Identify and use variable assignment (LET, INPUT, DATA/READ).
5. Identify and use various formats for output in BASIC, (PRINT statement with comma, semicolon, and tab for formatting).
6. Identify and use control statements in BASIC:
   - The GOTO statement.
   - The IF/THEN statement.
   - The FOR-NEXT statement.
   - The GOSUB statement.
7. Identify and properly use subroutines in BASIC.
8. Correctly predict the output of a given program sequence in BASIC.
9. Demonstrate skills in debugging programs in BASIC.

B. Develop problem-solving skills.

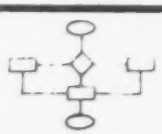
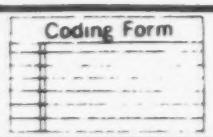
C. Writing reasonable structured programs.

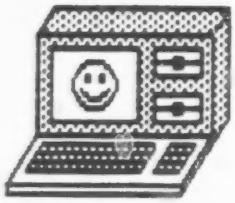
D. Interpreting error messages.

E. Finding and correcting program errors.

F. Predicting output of given programs.

PROGRAM DEVELOPMENT CYCLE

?	Understand the problem and plan the solution.
	Prepare a flowchart or other representation of the problem.
	Prepare the instructions in coded form.
	Test the program until it is working properly.
	Prepare detailed documentation of the program.



BASIC PROGRAMMING

All computers must have instructions to perform a task. A set of instructions that tells the computer what to do is called a program. Programs must be written in a language that the computer can understand.

There are many computer languages. Each one is designed for a particular purpose. Some of the common computer languages are:

BASIC	Beginners All-Purpose Symbolic Instructional Code
PASCAL	Named after Blause Pascal
FORTRAN	Formula Translator
COBOL	Common Business Oriented Language

The language most microcomputers use is BASIC. The BASIC language contains ordinary English words, but they must be used in a very precise way. Words such as RUN, PRINT, END, and GOTO are words used in the BASIC language.

The computer reads these words or instructions and carries them out.

How would you ask a computer what 13 + 15 equals or 15 - 13 equals? We want to instruct the computer to find the sum and difference of two numbers. When the program is typed into the microcomputer, it will appear on the computer screen this way.

```
10  PRINT  13 + 15
20  PRINT  15 - 13
30  END
```

Typing this program is what is called input. We are using the computer keyboard to enter the program into the computer. Lines 10, 20, and 30 make-up the program, or input. After each line of the program is typed, it is stored in the computer's memory.

After you type in a line, you press either RETURN or ENTER - depending on your computer's keyboard.

The computer will not process (add and subtract the numbers) until it is given a command. The command is RUN. RUN is a word in the BASIC language which means "process the instructions."

After RUN is typed, the computer will follow the instructions in the program.

- The computer will "READ" the first line of the program (line 1Ø). Then it will calculate and print the sum of 13 + 15, which is 28.
- The computer will then "READ" the next line of the program (line 2Ø). Then it will calculate and print the answer to 15 - 13, which is 2.
- The computer then will "READ" the next line (line 3Ø) which tells it to stop.

When the answers 28 and 2 appear on the screen, it is called output. Output is the result of running the program.

```
1Ø  PRINT  13 + 15
2Ø  PRINT  15 - 13
3Ø  END
RUN
28
2
```

GIVING YOUR COMPUTER INSTRUCTIONS

Each instruction starts with a line number. The lines must be numbered in the order you want the computer to follow them, starting with the lowest number. You may use any numbers for your line numbers, but programmers usually skip 10 lines at a time.

Instructions to the computer consist of statements and commands.

- Statements are words such as PRINT and END. They have line numbers. They are stored in the computer's memory but the computer does not follow the "statement instructions" without a "command."
- Commands tell the computer to do something immediately. They do not need line numbers.

Try this:

Program Input

```
1Ø  PRINT "HELLO"
2Ø  PRINT "GOODBYE"
3Ø  END
```

Command to process the program

```
RUN
```

Output -- what the computer prints

```
HELLO

GOODBYE
```

Remember:

Line 1Ø contains the word PRINT and HELLO inside quotation marks (" "). It tells the computer to print whatever is inside the quotation marks. So all you'll see on the screen after you RUN the program will be HELLO -- not PRINT HELLO.

Calculating

Program Input

```
1Ø  PRINT  "5 + 4 = "
2Ø  PRINT   5 + 4
3Ø  END
```

Command

```
RUN
```

Output (results)

```
5 + 4 =
9
```

Why didn't the calculation 5 + 4 in line 1Ø produce a sum in the output? Line 1Ø says to PRINT "5 + 4 = ". The computer only prints what is inside the quotes. In line 2Ø, the computer reads PRINT 5 + 4 and calculates the answer. The only result you see (output) is the sum of 5 + 4.

If you want the computer to print words, they must be written inside quotation marks. The computer will print anything that is put in quotation marks.

Input/ Statement	10 PRINT "COMPUTERS ARE FUN"
Command	RUN
Output	COMPUTERS ARE FUN

The output does not show the line number, the BASIC word PRINT, or the quotation marks.

Remember the difference between <u>input</u> and <u>output</u>:

- Input → any instruction or information that gets put <u>in</u> the computer.
  - Begins with a line number,
  - Uses a statement word to tell the computer what to do.
- Output → any information that comes <u>out</u> of the computer.

WHATS A BUG???

In computer language, a mistake in a program that prevents the program from running is called a <u>bug</u>. Getting the mistakes out of a program is called <u>debugging</u>. Some computers tell you "Syntax Error" if you have a mistake in your program.

This program was wrong. The person wrote the following but got an error message.

```
10 BRINT "NOT EVERY BUG IS AN INSECT"
RUN
SYNTAX ERROR in Line 10
```

Print is spelled wrong. The computer does not know what BRINT meant.

In order to debug this program, it needs to be rewritten.

```
10 PRINT "NOT EVERY BUG IS AN INSECT"
RUN
NOT EVERY BUG IS AN INSECT
```

The computer needs line numbers to do things in order. When a program is RUN, the computer will follow the statement with the lowest line number first. Then it will follow the next higher numbered statement, and so on.

The computer will follow the instructions starting with the lowest line number no matter in what order you typed in the lines. If you type in the line numbers out of order, and you want to see them in order, type in the word LIST - LIST is a command. It will command the computer to display all the numbered statements in a program in the right order.

Your teacher wants to print out the classes she has to teach this week. You need to type the program:

```
10 PRINT "MONDAY:  GED-HISTORY"
20 PRINT "WEDNESDAY:  GED-MATH"
30 PRINT "FRIDAY:  GED-SCIENCE"
```

You then find out she must teach on Tuesday night, so you include:

```
15 PRINT "TUESDAY:  GED-READING"
```

Your program looks like this:

```
10 PRINT "MONDAY:  GED-HISTORY"
20 PRINT "WEDNESDAY:  GED-MATH"
30 PRINT "FRIDAY:  GED-SCIENCE"
15 PRINT "TUESDAY:  GED-READING"
RUN
```

Your output will look like this:

```
MONDAY:  GED-HISTORY
TUESDAY:  GED-READING
WEDNESDAY:  GED-MATH
FRIDAY:  GED-SCIENCE
```

If you want your program to be in the right order, you use the command LIST. After you type in LIST, your program now looks like this:

```
LIST
10 PRINT "MONDAY:  GED-HISTORY"
15 PRINT "TUESDAY:  GED-READING"
20 PRINT "WEDNESDAY:  GED-MATH"
30 PRINT "FRIDAY:  GED-SCIENCE"
```

Symbols to Remember

- Most computers put a slash through the number zero (Ø) so you know it's a zero -- not the letter "O."
- * means to multiply (you cannot use the letter x). (3 * 4 = 12)
- / means to divide. Because there is no division sign on the keyboard, we use the slash. (16 / 4 = 4)

USING PUNCTUATION MARKS IN BASIC PROGRAMMING

Combining instructions saves time. You don't have to type a new line.

- A semicoln (;) in a PRINT statement tells the computer to continue on the same line.
- The semicolon tells the computer to continue the output on the same line, not to go onto the next line.

INPUT

```
1Ø  PRINT  " 15 + 5 =";
2Ø  PRINT    15 + 5
3Ø  END
RUN
```

OUTPUT

```
15 + 5 = 20
```

- You can also use the semicolon to put more than one PRINT instruction on a line with just one PRINT statement.

INPUT

```
1Ø  PRINT " 15 + 5 =";
2Ø  END
RUN
```

OUTPUT

```
15 + 5 = 20
```

- A comma (,) is used to combine instructions and print output in different zones on the same line.

  - A comma in a PRINT statement tells the computer to continue its output in different parts (zones) of the computer.

INPUT

```
10  PRINT  12 + 8,
20  PRINT  16 - 4,
30  PRINT   4 * 3,
40  END
RUN
```

OUTPUT

```
 20   12   12
```

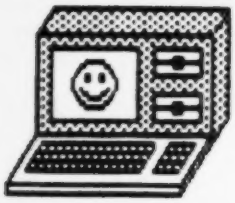
  - A comma can also be used to put more than one PRINT instruction on a line with just one PRINT statement.

INPUT

```
10  PRINT 6 + 3, 4 + 2, 5 + 3
20  PRINT 10 - 5, 3 * 4, 6 / 3
30  END
RUN
```

OUTPUT

```
 9   6   8
 5   12  3
```



BASIC COMMANDS AND STATEMENTS

COMMANDS

RUN	LOAD
LIST	SAVE
NEW	DELETE
DEL	CATALOG
CONT	LOCK
BRUN	UNLOCK

STATEMENTS

Control:

GOSUB
RETURN
END
GOTO
IF
FOR
NEXT

Action:

INPUT
LET
PRINT
REM
PLOT
HLIN
VLIN
HOME
SPEED=
FLASH
INVERSE
NORMAL
COLOR=
TEXT
GR

ACTIVITY

BASIC PROGRAMMING

1. Write the output for this program.

```
10 PRINT  14 + 6
20 PRINT  32 - 11
30 PRINT   5 * 6
40 PRINT  20/4
50 END
```

2. Write the output for this program.

```
10 PRINT  "14 + 6 ="
20 PRINT  "32 - 11 ="
30 PRINT    3 * 4
40 PRINT  "20/4="
50 END
```

3. Write a program using line numbers and symbols that will give you this output.

```
25 - 5  =
20
```

4. Write a program that will give this output.

```
The answer is
10
```

Answers:

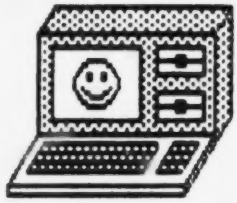
1.
```
20
21
30
 5
```

2.
```
14 + 6 =
32 - 11 =
12
20/4
```

3.
```
10 PRINT "25 - 5 ="
20 PRINT  25 - 5
30 END
RUN
```

4.
```
10 PRINT "The answer is"
20 PRINT 60 - 50 *
30 END
RUN
```

*could be other combinations



ACTIVITY

Type in this program. (Press ENTER or RETURN after each line.)

```
10 PRINT "This is a computer!!"
20 GO TO 10
```

Now RUN your program by typing RUN and pressing ENTER/RETURN.

When you want to stop the lines on the screen, press the BREAK key.

To clear the screen, type HOME or press CLEAR.

Type LIST. And press ENTER/RETURN. You will see a copy of your program on the screen.

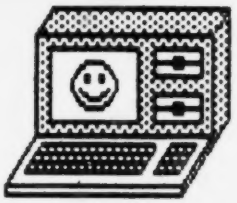
To get rid of line 20. Type 20 and press ENTER/RETURN.
Press clear.
Type LIST. Line 20 should not appear.

Press CLEAR to clear the screen.

To get rid of the program, type NEW.

FOR YOU TO DO

Write a program which will print your name on the screen lots and lots of times.



ACTIVITY

Type in this program.

```
10 PRINT "Computers are Fun!";
20 GO TO 10
```

Type RUN, and press ENTER/RETURN.
The ; (semicolon) makes the phrase Computers are Fun appear over and over, one right after another.

Remember, only the phrase written inside the " " will appear.

FOR YOU TO DO

Write a program which will print your name all over the screen.

GOTO

The computer will go to any line you send it to when it sees the BASIC word GOTO. It will skip as many lines as you want. Just tell it which line number it should go to.

```
10 PRINT "I CAN KEEP A SECRET."
20 PRINT "I WON"T TELL A SOUL."
30 GOTO 60
40 PRINT "I'LL JUST TELL AMY."
50 PRINT "AND JOE, AND GARY."
60 PRINT "ABSOLUTELY NO ONE."
```

After you type RUN the computer will print line 10, line 20 and because line 30 commands it to go to line 60, it will then skip line 40 and 50 and print line 60.

```
RUN
I CAN KEEP A SECRET.
I WON'T TELL A SOUL.
ABSOLUTELY NO ONE.
```

LOOPS

A LOOP makes the computer do something over and over. If a program is in a loop it will keep repeating itself over and over again. (On most computers, the only way to get out of a loop is to press the CONTROL key or BREAK key.)

This program is written in a loop.

```
10 PRINT "THIS IS A COMPUTER"
20 PRINT "IT IS FUN TO USE"
30 PRINT "I KNOW HOW TO PROGRAM IT"
40 GOTO 10
```

After you type in RUN, the program will show on the screen lines 10, 20 and 30 over and over and over until you stop the program.

```
THIS IS A COMPUTER.
IT IS FUN TO USE.
I KNOW HOW TO PROGRAM IT.
THIS IS A COMPUTER.
IT IS FUN TO USE.
I KNOW HOW TO PROGRAM IT.
THIS IS A COMPUTER.
```

FOR - NEXT LOOPS

You can make the computer do something over and over. The computer will repeat the instructions inside a loop as many times as you want. A loop that tells the computer exactly how many times it must follow the same instructions is called a FOR - NEXT LOOP.

Any letter can be used in a FOR-NEXT LOOP. Remember that the same letter that is used in the FOR NEXT LOOP line must be used in the NEXT LINE.

You want the program to count from 1 to 10. Your program looks like this:

```
10  FOR A = 1 to 10
20  PRINT "A"
30  NEXT A
```

The output looks like this after you type run.

```
1
2
3
4
5
6
7
8
9
10
```

Can you answer the following questions on GOTO, LOOPS, and FOR-NEXT LOOPS?

1. Be a computer. Print the output of this program:

```
10 PRINT " DO YOU KNOW ME?"
20 GOTO 40
30 PRINT "YES"
40 PRINT "NO"
```

2. Be a computer. Print the output of this program.

```
10 PRINT "BE AT MY PARTY."
20 PRINT "IT WILL BE FUN."
30 GOTO 10
```

3. Be a computer. Print the output of this program.

```
10 FOR Q = 1 to 4
20 PRINT "UP, DOWN, TURN AROUND"
30 NEXT Q
```

VARIABLES

```
1Ø  A = 6
2Ø  B = 5
3Ø  PRINT A + B
```

The letter A in this program is called a variable, so is letter B. Lines 1Ø and 2Ø tell the computer that the value of A is 6, and the value of B is 5. Line 3Ø tells the computer to add A and B, then print the answer.

```
1Ø  A = 6
2Ø  B = 5
3Ø  PRINT A + B
RUN
11
```

The computer doesn't print anything from lines 1Ø and 2Ø but remembers what the lines say about the values of A and B are and then does what line 3Ø tells it to do.

INPUT

INPUT is a statement word that tells the computer that someone will put in a value.

```
10 PRINT "HOW OLD ARE YOU?"
20 INPUT N
```

In this example, the computer will ask "HOW OLD ARE YOU?" The letter N (line 20)is a variable and you can put in any number to tell the computer how old you are. Every time you run the program, you can type a different number into the computer. The INPUT line may need more than one variable. If the question requires two-number answer, the INPUT line will have two letters.

```
10 PRINT "TYPE IN TWO NUMBERS"
20 INPUT N, L
```

STRINGS

A computer string is a variable that can stand for letters, numbers, or other keyboard symbols. A "string variable" is made up of a letter with a dollar sign after it; for example: E$

For the following program:

```
10 PRINT "WHAT IS THE STATE CAPITAL?"
20 INPUT M$
RUN
WHAT IS THE STATE CAPITAL?
?
```

M is a variable (you can use any letter); $ is the symbol for a string. M$ is called the string variable. INPUT M$ tells the computer that someone is going to type in letters, numbers, or keyboard symbols. If a number is in a string, it can't be used for arithmetic. You can't add or subtract numbers that are in strings.

After running this program a question mark appears. The computer is asked for you to type in the capital of Texas.

IF - THEN STATEMENT

Although a computer can't think for itself, it can make a decision or comparison using an IF-THEN statement.

```
10 PRINT "HOW MANY DIMES IN A DOLLAR?"

20 INPUT N

30 IF N=10 THEN PRINT "YOU'RE RIGHT!"

40 IF N <>10 THEN PRINT "WRONG, IT'S 10."

RUN

HOW MANY DIMES IN A DOLLAR?

?
```

In this program:

Line 10 tells the computer to ask a question (HOW MANY DIMES IN A DOLLAR?)

Line 20 tells the computer to print a question mark and wait for someone to type in the answer.

Line 30 and 40 tell the computer to compare the answer with the correct information, then make a decision.

- Line 30 says if someone puts down the answer 10 (= means equal to or the same as) at the ? (if N=10) then print the answer "YOU'RE RIGHT." (THEN PRINT "YOU'RE RIGHT")

- Line 40 says if someone types in any number "not equal to" or "not the same as" (<>) 10 then print "WRONG, IT'S 10."

Symbols used in an IF-THEN statement:

SYMBOLS	MEANINGS
=	is equal to
>	is greater than
<	is less than
>=	is greater than or equal to
<=	is less than or equal to
<>	is not equal to

Notice the spaces between the first quotation marks (") and the start of the tree. That spacing is important information you give to the computer.

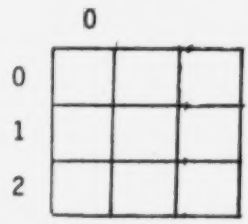
You can use character graphics to make other designs. You can use lots of regular letter L's to create a giant L. You can also make a face using O's.

"Resolution" means the amount of detail that computer graphics have. When you write a graphics program, it is as if you are telling the computer what squares to color in on the monitor. These squares - or pixels - are actually tiny dots of light. The more pixels that are available, the more detailed the drawing can be.

If a computer system can produce very detailed drawings, it is said to have high resolution graphics. A computer that produces a drawing with less detail is said to produce low resolution graphics.

HOW IT WORKS

When you look at a computer screen you're really looking at thousands of tiny boxes of light. Imagine the computer screen as made up of little boxes - each box is called a pixel. The average screen contains about 25,000 pixels. Each pixel can be identified by its coordinates.



For example, in a grid that starts at 0, if a pixel is in the third column down and the second row across, its coordinates are 2, 1.

When you draw a picture on your computer, your computer addresses each pixel, telling it to turn on or off. You can control the color and brightness of each pixel. If you draw the outer frame of a box, the specific pixels that create the shape of the box turn on. Most of our personal computers don't necessarily have the capacity to address each pixel individually. Instead, they address blocks of four or eight pixels as one unit. This creates a boxy look.

What do you remember about variables, input, strings and if-then statements?

A. Be a computer. Print the output of these programs.

1.

```
1Ø C=12
2Ø D=4
3Ø PRINT C+D
RUN
```

2.

```
1Ø S=15
2Ø T=10
3Ø PRINT 15-10
RUN
```

3.

```
1Ø X=36
2Ø Y=6
3Ø PRINT 36/6
RUN
```

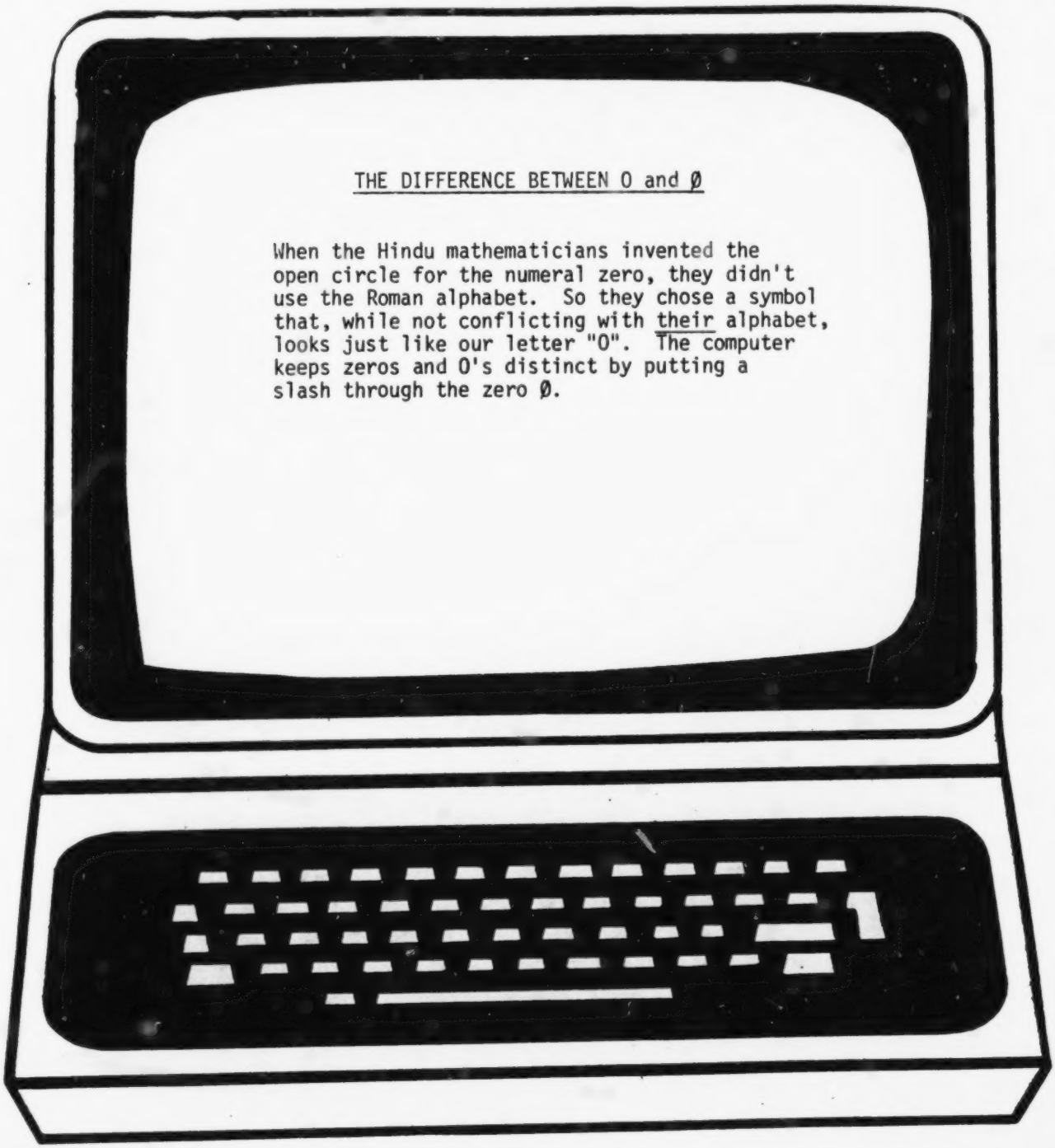
4.

```
1Ø A=4
2Ø B=6
3Ø PRINT 4*6
RUN
```

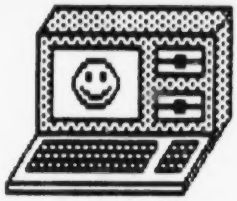
B. Joe tells the computer to print "RIGHT" if sometypes in the number 5. Circle the instruction the computer will follow?

1. 3Ø IF N=5 THEN PRINT "RIGHT"
2. 3Ø IF N is 5 THEN PRINT "RIGHT"
3. 3Ø IF N>8 THEN PRINT "RIGHT"

DID YOU KNOW??


THE DIFFERENCE BETWEEN O and Ø
When the Hindu mathematicians invented the open circle for the numeral zero, they didn't use the Roman alphabet. So they chose a symbol that, while not conflicting with their alphabet, looks just like our letter "O". The computer keeps zeros and O's distinct by putting a slash through the zero Ø.

103



Basic Statements - Let Statements

The following shows how the computer determines values of the variables which are stored in the computer memory.

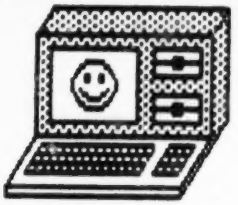
Basic Statements	Variables				
	I	J	K	L	M
10 LET I = 16	16				
20 LET J = 4		4			
30 LET K = I + J			20		
40 LET L = K/J				5	
50 LET M = L * 3					15
60 LET I = M - L	10				
70 LET J = J + 5		9			

Simulation

When you simulate running a program, you pretend to run it. Simulating helps you find errors in your program before you go to the computer.

In the chart below, fill in how the computer stores the variables in memory and what the output of the program would be once the command RUN has been typed.

	A	B	C	
10 LET A = 22				(22)
20 LET B = A + 6				(28)
30 LET C = B + A				(50)
40 PRINT C				(50)
50 END				
	Output:			



ACTIVITY

How the computer does math.

Type in this program.

```
10 PRINT 35 + 25
20 PRINT 100 + 400
30 PRINT 9 * 3
40 PRINT 50/2
50 PRINT 6 - 4
```

Type RUN. Press ENTER/RUN. You should get a screen that shows:

```
65
500
27
25
2
```

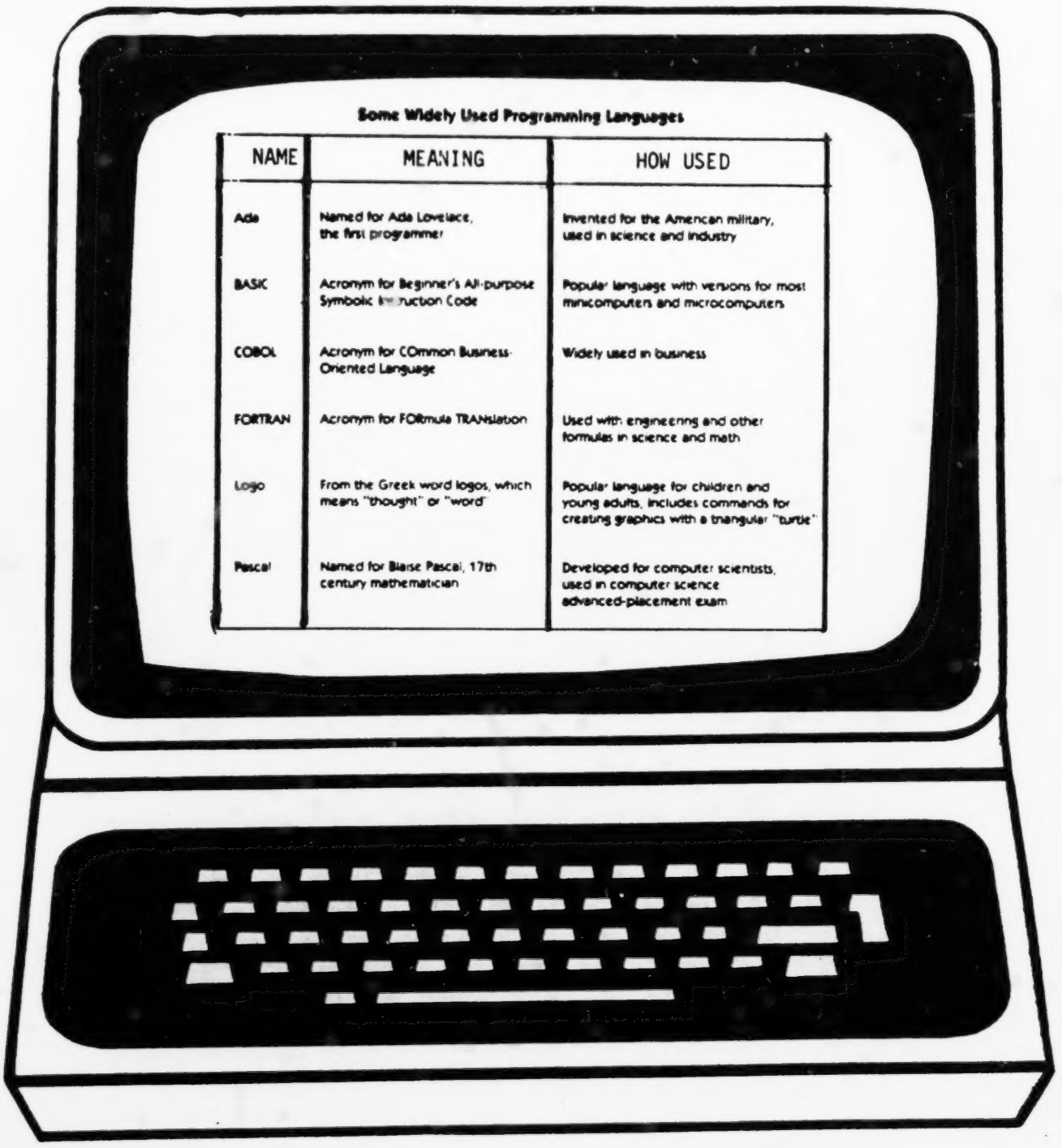
If you had wanted the problem to appear on the screen, you would have had to put 35 + 25 inside quotes.

```
10 PRINT "35 + 25 = "
```

Remember -

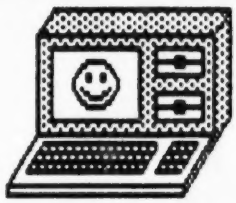
+ means add
- means subtract
/ means divide
* means multiply

DID YOU KNOW??



Some Widely Used Programming Languages

NAME	MEANING	HOW USED
Ada	Named for Ada Lovelace, the first programmer	Invented for the American military, used in science and industry
BASIC	Acronym for Beginner's All-purpose Symbolic Instruction Code	Popular language with versions for most minicomputers and microcomputers
COBOL	Acronym for COmmon Business-Oriented Language	Widely used in business
FORTRAN	Acronym for FORmula TRANslation	Used with engineering and other formulas in science and math
Logo	From the Greek word logos, which means "thought" or "word"	Popular language for children and young adults. Includes commands for creating graphics with a triangular "turtle"
Pascal	Named for Blaise Pascal, 17th century mathematician	Developed for computer scientists, used in computer science advanced-placement exam



BEFORE YOU START.....

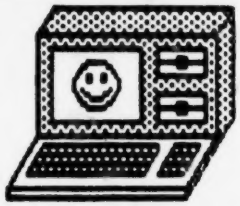
There is a special key on the keyboard that you will use a lot. On some computers it is the ENTER key. On other computers it is the RETURN key. This key "enters" the instructions of your program into the computers' memory. You must press this key each time you finish typing an instruction.

To start writing instructions on the computer you need a prompt on the screen. The prompt is a symbol that means the computer is waiting for you. Some computers do not have a prompt. Most prompts look like > or] .

The cursor shows where the next character will appear on the screen as you type. Cursor comes from the Latin word 'cursor', which means "runner". (The cursor 'runs' across the screen.) Depending on the computer, the cursor looks like ■ or _ .

DID YOU KNOW??

IMMEDIATE MODE
There is a quick way to use the computer as a typewriter.
Type in:
PRINT 9*5
Then press the RETURN (or ENTER) key. The computer then prints 45.
Using the immediate mode means you can print words, or calculate numbers without writing a program (no line numbers) - but you can't save your instructions, and you can't tell the computer to RUN it again.



Some words in BASIC are called *system commands*. They tell the computer what to do with a program that is stored in its memory. They are not part of the program itself. Other BASIC words are called *key words* or *program commands*. They are used in programs to tell the computer what to do with each program statement. Here is a handy checklist of common system commands and key words.

System Commands

Command	Meaning
■ NEW	Tells the computer to erase any programs that have previously been stored in RAM
■ LIST	Tells the computer to show you the instructions that are stored in RAM
■ RUN	Tells the computer to execute (or carry out) the instructions that are stored in RAM

Key Words

BASIC Word	Meaning
■ PRINT	Tells the computer to show quoted information or the answer to an arithmetic problem, on the monitor
■ GOTO	Tells the computer to go immediately to a specified line number
■ INPUT	Tells the computer to expect variable information to be entered into memory
■ LET	Gives a value to a variable
■ IF-THEN	Tells the computer that if a certain condition holds true, it must carry out a certain instruction
■ FOR-NEXT	Tells the computer to do something a specified number of times
■ END	Used to show where a program ends
■ REM	Short for REMark; used to identify programs or parts of programs

PROGRAMMING GOSUB

TEACHING AND COMPUTERS • FEBRUARY 1986

BY SANDRA MARKLE

BEGINNER TASK CARD CONCEPTS

A program is a list of instructions that tells the computer to do a job or combination of jobs.

Here is a short program that is written in BASIC. It tells the computer how to process 2x2.

```
NEW
10 PRINT 2*2
20 END
```

In this program, NEW tells the computer to erase everything in its current memory and get ready to store the program that follows. (Because the NEW command is not part of the program, it does not require a line number.)

The sample program has two lines, 10 and 20. In a program line, the number of the line comes first, followed by a space, the BASIC command word, and whatever information and other command words the computer needs to perform the task (2*2, for example).

Line numbers are always in numerical order. Also, they are often in multiples of 10 so that additional lines can be added in the middle of the program. For example, type 15 PRINT 3*3 and press RETURN or ENTER. Then type LIST and press RETURN or ENTER. (LIST tells the computer to list all the program lines.) Line 15 has automatically been inserted between lines 10 and 20.

The END command in line 20 signals the computer to stop executing the program.

To make the computer start executing the program, type RUN and press RETURN or ENTER. (Again, RUN is not part of the program and so does not require a line number.) The computer executes the lines, one at a time, in line statement order. For this program, it first multiplies 2x2 (line 10) and displays the output, 4. Then it multiplies 3x3 (line 15) and displays 9.

To erase a line from the computer's memory, type the line number and press RETURN or ENTER. For example, type 15 and press RETURN or ENTER. List the program again. Line 15 has been erased.

INTERMEDIATE TASK CARD COMMANDS

One program can often involve several tasks. For example, a program that drills math facts might display problems, check students' answers, and calculate scores.

One way to make such programs more efficient is to combine all the commands that perform a specific task into a single block. These blocks are called *routines*. The main block is called the *main routine*. Secondary blocks are called *subroutines*.

Using the GOSUB command, the programmer can make the computer exit the main routine and go to a specific subroutine. To specify which subroutine, the programmer writes the command GOSUB and then the number of first line of the subroutine. (For example: GOSUB 2000.) The computer then executes all the commands in the subroutine until it encounters the RETURN command. RETURN tells the computer to return to the place in the main routine where it left off. (Actually, it returns to the statement following the GOSUB line that previously made it exit.)

Subroutines can be called up in this manner any number of times and at any point in the program.

When using paired GOSUB . . . RETURN commands, programmers often make liberal use of the REM statement. The REM (for "remarks") statement is used to include notes in a program listing. These notes are not displayed when the program is processed. A REM statement directly after GOSUB and its line number, or one at the beginning of a subroutine, can be used to explain what task a specific subroutine is performing. This helps readers keep track of the program's flow and helps the programmer debug the program. (See Intermediate Task Card 7 for examples.)

There are three common errors that occur with GOSUB . . . RETURN. First, the programmer might use a nonexistent or incorrect line number after GOSUB. Second, the programmer might forget to include a RETURN command at the end of the subroutine. And third, programmers might forget to put an END command at the end of the main routine.

USING THE TASK CARDS

Following are the teaching objectives and answers for each of the four BASIC task cards.

Beginner #7: Students debug a program that converts 12 inches to its equivalent in centimeters. They then write their own programs to convert other English measurements to equivalent metric units.

Answer to Activity 1:

30 centimeters

```
NEW
10 PRINT "12 INCHES ="
20 PRINT 12 * 2.5
30 PRINT "CENTIMETERS"
40 END
```

Answer to Activity 2:

1. 16.5 feet.

```
10 PRINT "5 METERS ="
20 PRINT 5 * 3.3
30 PRINT "FEET"
40 END
```

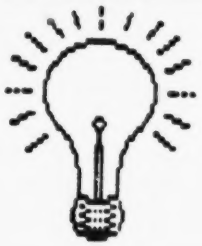
2. 18 inches.

```
10 PRINT "45 CENTIMETERS ="
20 PRINT 45 * .4
30 PRINT "INCHES"
40 END
```

3. 6.6 yards.

```
10 PRINT "6 METERS ="
20 PRINT 6 * 1.1
30 PRINT "YARDS"
40 END
```

(continued)



Beginner #8: Students write a program to convert inches to feet. They then modify the program to make other English measurement conversions.

Answer to Activity 1:

58 feet

```
NEW
10 PRINT "174 INCHES = "
20 PRINT 174/3
30 PRINT "FEET"
40 END
```

Answer to Activity 2:

1. 540 inches.

```
10 PRINT "15 YARDS = "
20 PRINT 15 * 36
30 PRINT "INCHES"
```

2. 12 yards.

```
10 PRINT "36 FEET = "
20 PRINT 36/3
30 PRINT "YARDS"
```

3. 6 yards.

```
10 PRINT "216 INCHES = "
20 PRINT 216/36
30 PRINT "YARDS"
```

4. 540 inches.

```
10 PRINT "45 FEET = "
20 PRINT 45 * 12
30 PRINT "INCHES"
```

Intermediate #7: Students add subroutines to complete a multiplication drill program.

Answer:

```
2000 C = N * M
2010 IF X = C THEN PRINT "CORRECT!":S
= S + 1
2020 IF X<>C THEN PRINT "NO, IT'S
";C;"."
2030 RETURN
3000 PRINT "SCORE = ";S;" CORRECT
OUT OF 10."
3010 RETURN
```

Intermediate #8: Students debug a program that takes a poll.

Answer: The following lines should read:

```
50 GOSUB 1000:REM GET RESPONSES TO
QUESTION
130 END
1130 RETURN
```

■

CUT OUT AND LAMINATE

BEGINNER

7

BASIC TASK CARD

The King's New Shoes

ACTIVITY 1

King Oscar wants to order a new pair of shoes. He knows his foot is 12 inches long, but the shoemaker only makes shoes in metric units. To place his order, King Oscar has to know how many centimeters long his foot is. Fortunately, he has a computer program to help him figure this out. Unfortunately, the program has five bugs in it. Find and fix the mistakes. Then enter and run the program. How many centimeters is King Oscar's foot?

```
10 NEW
PRINT "12 INCHES ="
20 12 * 2.5 PRINT
30 END
40 PRINT "CENTIMETERS"
50 RUN
```

ACTIVITY 2

Write your own programs to change each of these metric measurements into its *equivalent* (what it is equal to) in English measurements. Write the programs on a separate piece of paper. Enter and run them to make sure they work.

1. Change 5 meters to its equivalent in feet. (Hint: There are 3.3 feet to a meter.)
2. Change 45 centimeters to its equivalent in inches. (Hint: one centimeter equals .4 inches.)
3. Change 6 meters to its equivalent in yards. (Hint: There are 1.1 yards to a meter.)

ANSWERS: Check your programs with your teacher.

BEGINNER

BASIC TASK CARD

Recipe for a PROGRAM

ACTIVITY 1

Writing a program is like following a recipe. Below are "ingredients" for a program that figures out how many feet are in 172 inches. Use the ingredients to write the program on a separate piece of paper. Then type it into your computer and run it to make sure it works.

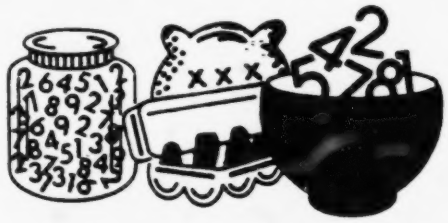
Ingredients for the Program

1. A command to erase the micro's memory.
2. A line statement to display: 174 INCHES =.
3. A line statement to display the answer to: 174/3.
4. A line statement to display: FEET.
5. A line statement to tell the computer to stop processing.

ACTIVITY 2

Write four more programs. Let each do one of the following:

1. Change 15 yards to an equivalent in inches.
2. Change 36 feet to its equivalent in yards.
3. Change 216 inches to its equivalent in yards.
4. Change 45 feet to its equivalent in inches.

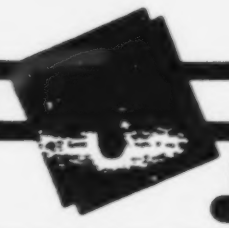


ANSWERS: Check your programs with your teacher.

CUT OUT AND LAMINATE

BASIC TASK CARD

3 INTERMEDIATE



MISSING PARTS

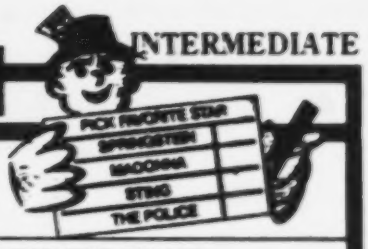
The program below is supposed to drill you on 10 multiplication problems. However, two of its three subroutines are missing. Fill in the missing subroutines. Then enter and run the program. Use the program to practice your multiplication skills.

```
NEW
10 REM MULTIPLICATION DRILL PROGRAM
20 PRINT "ENTER A NUMBER FROM 2 TO 10."
30 INPUT N
40 IF N<2 OR N>10 THEN PRINT "ENTER ANOTHER NUMBER.":GOTO 20
50 S = 0
60 FOR M = 1 TO 10
70 GOSUB 1000: REM SUBROUTINE THAT DISPLAYS THE PROBLEM AND GETS THE ANSWER FROM THE PLAYER
80 GOSUB 2000: REM SUBROUTINE THAT CALCULATES ANSWER, CHECKS PLAYER'S RESPONSE, AND ADDS 1 TO THE SCORE (S) IF THE ANSWER IS CORRECT
90 NEXT M
100 GOSUB 3000: REM SUBROUTINE THAT DISPLAYS FINAL SCORE
110 END
99 REM DISPLAY PROBLEM
1000 PRINT "WHAT IS  ";N;"x";M;"?"
1010 INPUT X
1020 RETURN
1999 REM CALCULATE AND COMPARE ANSWER
2000 _____
2010 _____
2020 _____
2999 REM FINAL SCORE
3000 _____
3010 _____
```

ANSWERS: Check your programs with your teacher.

8 INTERMEDIATE

BASIC TASK CARD



The People's CHOICE

Polls are surveys that help you find out what people think. The program below helps you find out which rock group or star is most popular among your friends. The program has a few bugs in it, however. Find and fix the bugs. Then type in and run the program.

```
NEW
10 REM POLL PROGRAM
20 PRINT "HOW MANY PEOPLE WILL TAKE THE POLL?"
30 INPUT P
40 FOR I = 1 TO P
50 GOSUB 2000:REM GET RESPONSES TO QUESTION
60 NEXT I
70 REM RESULTS
80 PRINT A;" VOTED FOR BRUCE SPRINGSTEEN"
90 PRINT B;" VOTED FOR MADONNA"
100 PRINT C;" VOTED FOR THE POLICE"
110 PRINT D;" VOTED FOR STING"
120 PRINT E;" VOTED FOR NONE OF THESE."
1000 PRINT:PRINT "ENTER THE NUMBER (1-5) OF YOUR FAVORITE ROCK GROUP OR STAR."
1010 PRINT "1. BRUCE SPRINGSTEEN."
1020 PRINT "2. MADONNA."
1030 PRINT "3. THE POLICE."
1040 PRINT "4. STING."
1050 PRINT "5. NONE OF THESE."
1060 INPUT N
1070 IF N<1 OR N>5 THEN PRINT "ENTER A NUMBER FROM 1 TO 5.":GOTO 1060
1080 IF N = 1 THEN A = A + 1
1090 IF N = 2 THEN B = B + 1
1100 IF N = 3 THEN C = C + 1
1110 IF N = 4 THEN D = D + 1
1120 IF N = 5 THEN E = E + 1
```

ANSWERS: Check your program with your teacher.

GOTO/READ. . .DATA

BY SANDRA MARKLE

In this installment of the "BASIC Challenge Cards" column, beginning programmers learn how to use the GOTO command to create program loops; intermediate programmers learn how to use the READ . . .DATA command to assign values to variables.

The column includes two activity cards for beginners and two activity cards for intermediate level students. Accompanying the cards is a section of teachers' notes that define the new commands and provide learning objectives and answers to the task card activities.

BEGINNER TASK CARD COMMANDS

The GOTO command, which is always followed by a line number, instructs the computer to jump to a specific section of the program. This command is particularly useful in making the computer repeat a set of commands continuously. This repetition of commands is called a *loop*. The following program is an example of a program loop created with GOTO.

```
NEW
10 PRINT "GARBAGE"
20 GOTO 10
30 END
```

Enter the program into your computer. Line 10 instructs the computer to display the word GARBAGE on the screen. The GOTO 10 command in line 20 sends the computer back to line 10, where it again displays the word GARBAGE. The computer continues to pass from line 10 to line 20 and back again without stopping, each time displaying the word GARBAGE.

Run the program. Because the computer never reaches the END statement in line 30, the program never ends. To stop it, press the BREAK key or the CTRL and C keys simultaneously. (If you have a Commodore, press the RUN/STOP and RESTORE keys simultaneously.)

INTERMEDIATE TASK CARD COMMANDS

In the first installment of this column (October 1985), intermediate programmers learned how to use the INPUT command to assign values to variables.

For example, the following program asks the user to enter two numbers, which the computer then assigns to the variables A and B (line 20). In line 30, the computer adds the numbers and displays the answer.

```
NEW
10 PRINT "WHAT TWO NUMBERS DO
   YOU WANT TO ADD?"
20 INPUT A,B
30 PRINT A;" + ";B;" = ";A + B
40 END
```

Notice that the user can only assign one value at a time to the variables. To add six pairs of numbers, for example, he or she would have to run the program six times.

The paired commands READ . . .DATA allow programmers to assign values to variables more efficiently. Enter this revised version of the program into your computer.

```
NEW
10 DATA 2,4
20 DATA 6,8
30 DATA 3,5
40 DATA 1,7
50 DATA 9,2
60 DATA 4,6
70 READ A,B
80 PRINT A;" + ";B;" = ";A + B
90 GOTO 70
100 END
```

The DATA statements in lines 10 through 60 contain the six pairs of numbers that are to be added. (Notice that each piece of data, in this case each number, is separated by a comma.) These DATA statements can appear anywhere in the program: beginning, middle, or end. Also, they could be grouped together in one spot or scattered throughout. No matter where the DATA statements appear in the program, the values that they contain will be processed in order. Therefore, in this program, the numbers 2 and 4 (line 10) will be processed first and the numbers 4 and 6 (line 60) will be processed last.

The READ statement in line 70 signals the computer to assign values to the variables A and B. First, the computer assigns the values 2 and 4 to the variables. In line 80, the computer adds the numbers and displays the answer (6).

The GOTO statement in line 90 sends the computer back to the READ statement. Because the computer has already processed the first two numbers in the DATA statements, it moves on to the next two numbers, which are 6 and 8 (line 20). It assigns these new numbers to the variables A and B, adds them together, and displays the answer (14).

Next, the computer loops back to the READ statement to process the third set of numbers (line 30), and then the fourth, the fifth, and, finally, the sixth set of numbers.

Run the program. Your screen will look like this:

```
RUN
2 + 4 = 6
6 + 8 = 14
3 + 5 = 8
1 + 7 = 8
9 + 2 = 11
4 + 6 = 10
OUT OF DATA
```

The OUT OF DATA message means that the computer ran out of values to process. To prevent this signal from appearing, programmers add a dummy piece of data, called a *flag*, to signal the end of the data. The flag can be any value that is not contained in a previous DATA statement. Add

these lines to the program:

```
65 DATA -1,-1
75 IF A = -1 THEN 100
```

Line 75 tests for the flag (-1). If the statement is true, the computer exits the loop and ends the program (line 100). If it is false, the computer continues processing. Run the program again. This time, the computer will display the six math equations and then simply stop processing.

In this program, once a value has been read and processed, it is discarded. To reuse that value, you can use the RESTORE command. The RESTORE command sets the computer's pointer back to the first piece of data so that it can be read again. Add these lines to the program:

```
100 PRINT "LET'S SUBTRACT NOW."
110 RESTORE
120 READ A,B
130 IF A = -1 THEN 160
140 PRINT A;"-";B;" = ";A-B
150 GOTO 120
160 END
```

Run the program again. The computer will process the numbers in the DATA statements twice, first by adding and then by subtracting them.

READ. . .DATA and RESTORE statements can also be used to assign values to string variables. Simply substitute letters or words for the numbers in the DATA statements and substitute string variables, such as A$ and B$, for the numeric variables in the READ statement. (See the October, 1985 column for an introduction to string variables.)

Three rules to remember when using READ. . .DATA and RESTORE are: (1) Use a comma to separate pieces of data; (2) use a flag to avoid getting an OUT OF DATA error; (3) use numeric variables for values and string variables for letters and words.

USING THE TASK CARDS

Here are the learning objectives and answers for each of the four BASIC task cards.

Beginner #11: Students experiment with and debug a program that calculates the answer to a story problem. They should be familiar with the mathematical operators +, -, *, and /. *Answers:* (1) SYNTAX ERROR; (2) computer is locked in an infinite loop; (3) computer displays 14,277, which is the wrong answer; (4) 50.

Beginner #12: Students use the GOTO command to make an infinite loop. The loop makes the computer display a skyscraper that grows higher and higher. They use similar means to make a tree grow taller and a flag move up a flagpole. *Answers:* (1) 70 GOTO 40; (2 – 3) answers will vary.

Intermediate #11: Students debug and use a program that converts some English measurements to metric measurements, and vice versa. They then add two other measurement conversions to the program. Students should be familiar with decimals. *Answers:* (1) Change lines 120 and 1000 to:

```
100 RESTORE:FOR I = 1 TO C:READ
    X:NEXT I
1000 DATA 2.5,.9,1.6,.04,3.3
```

a) 6.3 meters; b) .64 inches; c) 40 kilometers; d) 10 centimeters; e) 19.8 feet.

(2) Add these lines to the program:

```
72 PRINT "6. OUNCES TO GRAMS."
73 PRINT "7. POUNDS TO KILOMETERS."
80 PRINT:PRINT "ENTER A NUMBER
   FROM 1 TO 7."
90 INPUT C:IF C < 1 OR C > 7 THEN 80
1000 DATA 2.5,.9,1.6,.04,3.3,28,.45
```

Intermediate #12: Students complete a number-guessing program that uses READ. . .DATA and RESTORE statements. *Answer:* 40 N = 1:HOME (Apple), PRINT CHR$(125) (Atari), PRINT CHR$(147) (Commodore), CLS (IBM and Radio Shack)

```
110 RESTORE
130 READ A$
1000 DATA SORRY. PLEASE TRY AGAIN.
1010 DATA BETTER LUCK NEXT TIME.
1020 DATA OOPS. MISSED AGAIN.
1030 DATA GIVE IT ONE MORE SHOT.
```

CUT OUT AND LAMINATE

BEGINNER

11

BASIC TASK CARD

ADMIT ONE

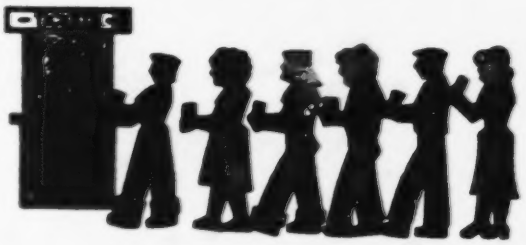
Story Problem:

Julie has 423 tickets to sell. She sells 168 on Thursday and 175 on Friday. How many does she have left to sell on Saturday?

This program is supposed to display the answer to the story problem. However, the line number is missing after the GOTO statement in line 20.

```
NEW
10 PRINT "THE ANSWER TO THE PROBLEM IS"
20 GOTO _____
30 PRINT 423 + (168-175)
40 PRINT 168 + 175 * 423
50 PRINT 423 - (168 + 175)
60 PRINT (168 * 175)/2 - 423
70 END
```

1. Run the program as it is. Write down what happens on a piece of paper.
2. Change line 20 to GOTO 20. Run the program again and write down what happens.
3. Change line 20 to GOTO 60. Run the program and write down what happens.
4. Debug the program by inserting the correct line number after GOTO in line 20. Write down the answer to the story problem.



ANSWERS: Check with your teacher.

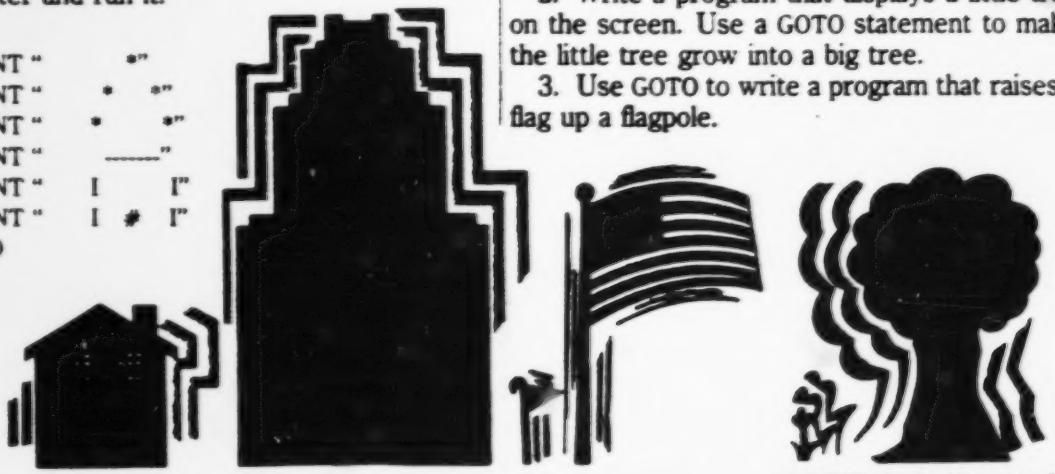
BEGINNER

MOVING UP

This program makes the computer draw a little house on the screen. Enter it into your computer and run it.

```
NEW
10 PRINT "        *"
20 PRINT "      *   *"
30 PRINT "    *       *"
40 PRINT "  ---------"
50 PRINT "  I       I"
60 PRINT "  I   #   I"
70 END
```

1. Add a GOTO command that will make the house stretch into a skyscraper.
2. Write a program that displays a little tree on the screen. Use a GOTO statement to make the little tree grow into a big tree.
3. Use GOTO to write a program that raises a flag up a flagpole.

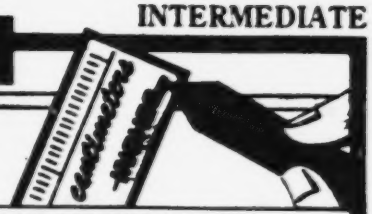


ANSWERS: Check with your teacher.

CUT OUT AND LAMINATE

INTERMEDIATE

11 FOR GOOD MEASURE



ACTIVITY 1

The program at right is supposed to change some English measurements into metric measurements, and vice versa. However, it has three bugs in it. Find and fix the bugs. Then use the program to make these conversions:

a. 7 yards = _____ meters.
b. 16 millimeters = _____ inches.
c. 25 miles = _____ kilometers.
d. 4 inches = _____ centimeters.
e. 6 meters = _____ feet.

ACTIVITY 2

Change the program so that it can convert ounces to grams (1 ounce = 28 grams) and pounds to kilograms (1 pound = .45 kilograms).

```
10 REM CHANGE
20 PRINT "WHICH CHANGE DO YOU WANT TO
   MAKE?"
30 PRINT "1. INCHES TO CENTIMETERS."
40 PRINT "2. YARDS TO METERS."
50 PRINT "3. MILES TO KILOMETERS."
60 PRINT "4. MILLIMETERS TO INCHES."
70 PRINT "5. METERS TO FEET."
80 PRINT:PRINT "ENTER A NUMBER FROM 1 TO
   5."
90 INPUT C: IF C < 1 OR C > 5 THEN 80
100 RESTORE:FOR I = 1 TO C:READ _____:NEXT I
110 PRINT "ENTER THE NUMBER TO
    CHANGE.":INPUT N
120 PRINT "THE RESULT IS ";N * X;"."
130 PRINT "RUN IT AGAIN?"
140 INPUT A$: IF A$ = "Y" OR A$ = "YES" THEN 10
150 END
1000 DAT 2.5,.9,1.6,.04,3.3
```

Atari users: Add this line: 1 DIM A$(5)

ANSWERS: Check with your teacher.

INTERMEDIATE

BASIC TASK CARD

12 Guess Again

This program is part of a number guessing game for two people. One person enters a secret number and the other person gets five tries to guess what the number is. Complete the program by filling in the blanks. Then try it with a friend.

```
10 REM GUESS AGAIN
20 PRINT "ENTER A SECRET NUMBER FROM 1 TO
   100."
30 INPUT X:IF X < 1 OR X > 100 THEN 30
40 N = 1:_____:REM CLEAR THE SCREEN
50 PRINT "ENTER GUESS #";N;"."
60 INPUT Q
70 IF Q = X THEN PRINT "GREAT WORK!":GOTO
   150
80 IF N = 5 THEN PRINT "THE ANSWER IS
   ";X:GOTO 150
90 IF Q < X THEN PRINT "TOO LOW."
100 IF Q > X THEN PRINT "TOO HIGH."
110 _____:REM SET POINTER TO FIRST PIECE OF
    DATA
120 FOR I = 1 TO N
130 _____:REM ASSIGN DATA TO VARIABLE A$
140 NEXT I:PRINT A$:N = N + 1:GOTO 50
150 PRINT "SHALL WE PLAY AGAIN?"
160 INPUT Y$:IF Y$ = "Y" OR Y$ = "YES" THEN 10
170 END
1000 DATA _____:REM ADD A COMMENT
     THAT TELLS THE PLAYER TO GUESS AGAIN
1010 _____:REM ADD ANOTHER COM
     MENT TO THE PLAYER
1020 _____:REM ADD YET ANOTHER COM
     MENT
1030_____:REM ADD ONE LAST COMMENT
```

Atari users: Add this line: 1 DIM A$(100),Y$(5)

ANSWERS: Check with your teacher.

122

Editing/Top-Down Programming

BY SANDRA MARKLE

Each month, the "BASIC Task Cards" column supplies you with four student activity cards that provide practice with BASIC programming skills. Accompanying the cards is a section of teachers' notes that defines concepts and commands introduced on the cards. The notes also supply teaching objectives and answers for the card activities.

Cut out and laminate the Beginner task cards (numbers 9 and 10) on page 45 and the Intermediate task cards (numbers 9 and 10) on page 47. Direct each student to the task cards that correspond to his or her level of programming expertise.

BEGINNER TASK CARD COMMANDS AND CONCEPTS

To correct or change a program, programmers use special commands and editing techniques. The program that follows is supposed to display the answer to the math problem 6 - 6, but it has an error in line 20:

```
NEW
10 PRINT "6
20 PRI " - 6"
30 PRINT " = "
40 PRINT 6 - 6
50 PRINT "THIS IS AN ADDITION PROB-
LEM."
60 END
```

Enter the program as is into your computer and run it. The computer will display 6 on the screen (line 10). It will then display a SYNTAX ERROR message. The error message is a result of the misspelled PRINT command in line 20.

To correct the error, type LIST 20 and press RETURN or ENTER. The computer will list only line 20. Retype line 20 correctly so that it reads: 20 PRINT "6 - 6". Run the program again. It now works.

To delete a line from the program, you simply type the line number and press RETURN or ENTER. For example, type 50 and press RETURN or ENTER. Type LIST and press RETURN or ENTER to see the revised program listing on the screen.

The LIST command is also useful for listing a specific portion of a program. For example, type LIST 20-30 to display lines 20 and 30 on the screen. Type LIST 20- to display lines 20 to the end of the program. And, type LIST -30 to display the beginning of the program to line 30.

If you are using an Atari or a Commodore computer, you can edit commands without having to retype the whole statement. First list the line you want to edit on the screen. Then use the arrow keys to move the cursor to the character in the statement that you want to change. To add a character, press the INSERT key and type the character. To delete the character to the left of the cursor, press the DELETE key. After making the change, press RETURN.

If you are using a TRS-80 computer, you can use the EDIT command to change program lines easier than with LIST. For example, to edit line 30 of the sample addition program, type EDIT 30 and press ENTER. This will appear on the screen: 30 PRINT " = "

Use the space bar to move the cursor to the very end of the line. Press the "I" key (for insert) and type a semicolon. Then press ENTER to exit the edit mode. Run the program again. This time, the answer to the problem is displayed on the same line as the equal sign.

INTERMEDIATE TASK CARD CONCEPTS

Just as a good paragraph has a topic sentence followed by supporting details, a well-organized BASIC program has a main routine followed by supporting subroutines. (For information on how to create subroutines, see last month's "BASIC Challenge Cards.")

When you organize a program in this way, you are using a *top-down* program design. To write a program with top-down design, follow these steps:

1. Write a step-by-step outline in English of what the program should do. Here is a sample outline for a program that asks the user for his or her name and age, and then comments on the user's age.

I. Ask user for his or her name.
II. Ask user for his or her age.
III. Tell user it is hard to believe he or she is the age that was input.

2. Use your outline to write a main routine. The main routine of a program is a series of BASIC line statements that provides an overview of the whole program. Here is one way to write the main routine for the *Name and Age* program.

```
10 REM NAME AND AGE PROGRAM
20 GOSUB 100 REM NAME
30 GOSUB 200 REM AGE
40 PRINT "IT'S HARD TO BELIEVE YOU
ARE "B" YEARS OLD."AS""
50 END
```

The two GOSUB commands in lines 20 and 30 send control of a program to different subroutines. Writing subroutines is the next step in top-down programming.

3. Write the subroutine or subroutines. A subroutine provides the precise steps for solving a smaller job within a program. Subroutines generally follow the main routine and often include a REM statement at the beginning of the subroutine and a RETURN command at the end.

Here is one way to write the first subroutine for the *Name and Age* program.

```
100 REM NAME
110 PRINT "WHAT IS YOUR NAME:
120 INPUT A$
130 RETURN
```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The second subroutine could be written like this:

```
200 REM AGE
210 PRINT "HOW OLD ARE YOU?"
220 INPUT B
230 RETURN
```

Here is what the entire program looks like.

```
10 REM NAME AND AGE PROGRAM
20 GOSUB 100: REM NAME
30 GOSUB 200: REM AGE
40 PRINT "IT'S HARD TO BELIEVE YOU ARE ";B;" YEARS OLD, ";A$"."
50 END
100 REM NAME
110 PRINT "WHAT IS YOUR NAME?"
120 INPUT A$
130 RETURN
200 REM AGE
210 PRINT "HOW OLD ARE YOU?"
220 INPUT B
230 RETURN
```

USING THE TASK CARDS

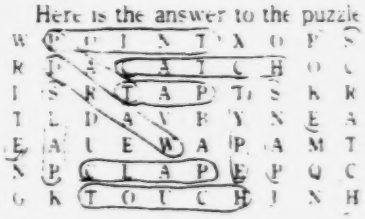
Here are the teaching objectives and answers for each of the four BASIC task cards.

Beginner Task Card #9: Students edit a program that displays the story of the Three Little Pigs. *Answers:* (1) Delete lines 20, 50, and 60; (2) Insert the first PRINT statement as line 35 and the second as line 45; (3) Change WRITE to PRINT in line 30 and insert the first quotation mark in line 40; (4) Answers will vary.

Beginner Task Card #10: Students edit a program that displays a word search puzzle. *Answers:* Here is the edited word search program.

```
10 PRINT "W P O I N T X O P S"
20 PRINT "R D A C A T C H O C"
30 PRINT "I S R T A P T S K R"
40 PRINT "T L D A V B Y N E A"
45 PRINT "E A U E W A P A M T"
50 PRINT "N P C L A P E P Q C"
60 PRINT "G K T O U C H J N H"
70 END
```

Here is the answer to the puzzle.



Intermediate Task Card #9: Students write a program of top-down design that displays the words to the song, *Oh, Susanna!*. *Answer:*

```
10 REM OH, SUSANNA!
20 GOSUB 1000:REM CHORUS
30 GOSUB 2000:REM VERSE
40 GOSUB 1000:REM CHORUS
50 END
1000 REM CHORUS
1010 PRINT "OH, SUSANNA! OH, DON'T YOU CRY FOR ME."
1020 PRINT "I'VE COME FROM ALABAMA WITH MY BANJO ON MY KNEE."
1030 RETURN
2000 REM VERSE
2010 PRINT "I CAME FROM ALABAMA WITH MY BANJO ON MY KNEE."
2020 PRINT "I'M GOING TO LOUISIANA, MY TRUE LOVE FOR TO SEE."
2030 PRINT "IT RAINED ALL NIGHT THE DAY I LEFT,"
2040 PRINT "THE WEATHER IT WAS DRY."
2050 PRINT "THE SUN SO HOT I FROZE TO DEATH,"
2060 PRINT "SUSANNA DON'T YOU CRY."
2070 RETURN
```

Intermediate Task Card #10: Students use top-down programming to complete a program listing. The program is a number game. *Answer:*

```
20 INPUT SN
30 HOME (Apple), CLS (Radio Shack), PRINT CHR$(125) (Atari), or PRINT CHR$(147) (Commodore)
50 IF Q>10 THEN GOSUB 2000:GOTO 200
70 INPUT N
80 IF N=SN THEN GOSUB 3000:GOTO 200
90 GOSUB 1000
210 INPUT A$
230 END
1030 RETURN
2020 PRINT "THE SECRET NUMBER IS ";SN
2030 RETURN
3030 PRINT Q;" GUESSES"
3040 RETURN
```

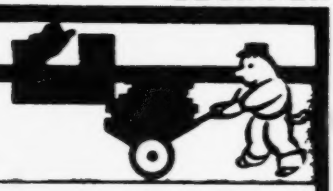
CUT OUT AND LAMINATE

BEGINNER

9

BASIC TASK CARD

A Pig-Tale



The program at right is supposed to display the story of the Three Little Pigs. First, however, it needs a few changes. Enter the program into your computer. Then make these changes:

1. Delete each line that doesn't belong in the story. Then type LIST and press RETURN or ENTER to see the new program.
2. Decide where the following PRINT statements fit into the program. Then give them line numbers and type them into the computer.

_____PRINT "THE BIG BAD WOLF BLEW DOWN THE STRAW HOUSE."

_____PRINT "THE BIG BAD WOLF BLEW DOWN THE STICK HOUSE."

3. Find and correct the two bugs in the program.
4. Write an ending for the story and add it to the program. Run the program to see the story.

```
NEW
10 PRINT "THE 3 LITTLE PIGS EACH DECIDED TO BUILD A HOUSE."
20 PRINT "CINDERELLA LOST ONE OF HER GLASS SLIPPERS."
30 WRITE "THE FIRST PIG BUILT HIS HOUSE OUT OF STRAW."
40 PRINT THE SECOND PIG BUILT HIS HOUSE OUT OF STICKS."
50 PRINT "SNOW WHITE TOOK A BITE OF THE WITCH'S APPLE."
60 PRINT "MARY'S LAMB FOLLOWED HER TO SCHOOL."
70 PRINT "THE THIRD LITTLE PIG BUILT HIS HOUSE OUT OF BRICKS."
80 END
```

BEGINNER

10

BASIC TASK CARD

HANDS ON EDITING

This program is supposed to display a word search puzzle on the screen. The words in the puzzle are all things that you can do with your hands. To make the program work, enter it into your computer and make these changes:

1. Replace lines 20 and 60 with these lines:

20 PRINT "R D A C A T C H O C"

60 PRINT "N P C L A P E P Q C"

2. Insert this line between lines 40 and 50:

_____PRINT "E A U E W A P A M T"

3. Delete lines 15 and 35.
4. Find three programming bugs and correct them.
5. Print out or copy the program on paper. Check it with your teacher. Can you find 13 actions that you can do with your hands?

```
NEW
10 TYPE "W P O I N T X O P S"
15 PRINT "X T N B M W R I V S"
20 PRINT "X E T R G H B N O I"
30 PRINT I S R T A P T S K R"
35 PRINT "G N W R Y I O X D F"
40 PRINT "T L D A V B Y N E A"
50 PRINT "Z E T Y J V B M E Q"
60 PRINT "G K T O U C H J N H"
70 PRINT END
```

CUT OUT AND LAMINATE

INTERMEDIATE

BASIC TASK CARD

SING ALONG

The American folk song *Oh, Susanna!* was written by Stephen Foster in the mid-1800s. Follow these steps to write a program that displays the chorus, the verse, and then the chorus again to *Oh, Susanna!*

1. On a sheet of paper, write a step-by-step outline in English that tells what the program will do.

2. On the computer, write a subroutine that uses PRINT statements to display the chorus to the song. Then write another subroutine to display the verse. (See words at right.)

3. Fill in the missing parts of this main routine and type it into the computer.

```
NEW
10 REM OH, SUSANNA!
20 _____:REM CHORUS
30 _____:REM VERSE
40 _____ REM CHORUS
50 _____:REM END PROGRAM
```

4. Arrange the main routine and the two subroutines you wrote into a program; then run it.

Oh, Susanna!

Chorus:

Oh, Susanna! Oh, don't you cry for me;
I've come from Alabama with my banjo on my knee.

Verse:

I came from Alabama with my banjo on my knee.
I'm going to Louisiana, my true love for to see.
It rained all night the day I left,
The weather it was dry;
The sun so hot I froze to death;
Susanna don't you cry.

INTERMEDIATE

BASIC TASK CARD

10 SECRET NUMBERS

In the *Guesser* program (listed below), you enter a secret number into the computer and a friend tries to guess what it is. Before the program can work, however, you must add a few commands. Fill in each blank in the listing, then type in and run the program to make sure it works.

```
NEW
0 REM GUESSER
10 PRINT "ENTER A SECRET NUMBER"
20 _____ REM ACCEPT NUMBER (SN)
30 _____ REM CLEAR THE SCREEN
40 Q = 0 REM Q = NUMBER OF GUESSES
50 IF Q >10 THEN _____ REM EXIT TO LOSER SUBROUTINE
THEN GO TO LINE 200
60 PRINT "ENTER YOUR GUESS"
70 _____ REM ACCEPT GUESS (N)
80 IF N = SN THEN _____ REM EXIT TO WINNER SUBROUTINE
THEN GO TO LINE 300
90 _____ REM EXIT TO HIGH OR LOW SUBROUTINE
100 Q = Q + 1 REM RUNNING TOTAL OF GUESSES
110 GOTO 50
200 PRINT "DO YOU WANT TO PLAY AGAIN (Y/N)?"
210 _____ REM ACCEPT ANSWER (A$)
220 IF A$ = "Y" THEN Q = 0:GOTO 10
230 _____ REM END-MAIN ROUTINE
1000 REM TOO HIGH OR LOW
1010 IF N<>SN THEN PRINT "TOO LOW!"
1020 IF N>SN THEN PRINT "TOO HIGH!"
1030 _____ REM END OF SUBROUTINE
2000 REM LOSER
2010 PRINT "YOU'RE OUT OF GUESSES."
2020 PRINT "THE SECRET NUMBER IS " _____
2030 _____ REM END OF SUBROUTINE
3000 REM WINNER
3010 PRINT "GREAT! YOU GOT THE NUMBER IN"
3030 PRINT _____ " GUESSES."
3040 _____ REM END OF SUBROUTINE
```

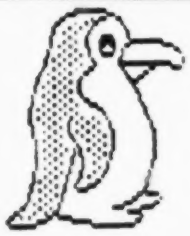
Note: If you have an Atari computer, add this line: `1 DIM A$(3)`

Twenty Basic BASIC Words for Six Microcomputer Systems

The chart below contains the simplest syntax in six microcomputer systems for the words in the left column. For refinements of some of these terms (for example, PRINTing a file), consult your particular system manual.

Semicolons here precede second or third options for using the BASIC word (for example, READ A, B; [or] READ A$, etc.). Commas here are required as part of the syntax.

Basic BASIC	Apple II+/e	Atari 400/800	Commodore 64	IBM PC	Texas Instruments	TRS-80: IV
Clearscreen	HOME	GR.0	[SHIFT+CLR keys]	CLS	CALL CLEAR	CLS .
DATA	DATA 5,6:J0	DATA 5,6:JO	DATA 5,6:JO	DATA 5,6:JO	DATA 5,6:JO	DATA 5,6:JO
DIM	DIM X(20)	DIM X(20)	DIM X(20)	DIM X(20)	DIM X(20)	DIM X(20)
END	END	END	END	END	END	END
FOR . . TO . . STEP	FOR B = 1 TO 9 STEP 2	FOR B = 1 TO 9 STEP 2	FOR B = 1 TO 9 STEP 2	FOR B = 1 TO 9 STEP 2	FOR B = 1 TO 9 STEP 2	FOR B = 1 TO 9 STEP 2
GOSUB	GOSUB 300	GOSUB 300	GOSUB 300	GOSUB 300	GOSUB 300	GOSUB 300
GOTO	GOTO 150	GOTO 150	GOTO 150	GOTO 150	GOTO 150	GOTO 150
IF . . THEN	IF R<10 THEN 90	IF R <10 THEN 90	IF R<10 THEN 90	IF R<10 THEN 90	IF R<10 THEN 90	IF R<10 THEN 90
INPUT	INPUT A;A$	INPUT A;A$	INPUT A;A$	INPUT A;A$	INPUT A;A$	INPUT A;A$
INT	INT(M)	INT(M)	INT(M)	INT(M)	INT(M)	INT(M)
LEFT$	LEFT$(H$,3)	—	LEFT$(H$,3)	LEFT$(H$,3)	—	LEFT$(H$,3)
LEN	LEN(H$)	LEN(H$)	LEN(H$)	LEN(H$)	LEN(H$)	LEN(H$)
MID$	MID$(H$,3,2)	—	MID$(H$,3,2)	MID$(H$,3,2)	—	MID$(H$,3,2)
NEXT	NEXT B	NEXT B	NEXT B	NEXT B	NEXT B	NEXT B
PRINT	PRINT A;A$;"HI!"	PRINT A;A$;"HI!"	PRINT A;A$;"HI!"	PRINT A;A$;"HI!"	PRINT A;A$;"HI!"	PRINT A;A$;"HI!"
READ	READ A,B:A$	READ A,B:A$	READ A,B:A$	READ A,B:A$	READ A,B:A$	READ A,B:A$
REM	REM (Comment)	REM (Comment)	REM (Comment)	REM (Comment)	REM (Comment)	REM (Comment)
RESTORE	RESTORE	RESTORE	RESTORE	RESTORE	RESTORE	RESTORE
RETURN	RETURN	RETURN	RETURN	RETURN	RETURN	RETURN
RIGHT$	RIGHT$(H$,2)	—	RIGHT$(H$,2)	RIGHT$(H$,2)	—	RIGHT$(H$,2)



Differences Between the Versions of BASIC

Atari-BASIC Does not have a TAB function. You can convert programs that use this function as follows:

a) replace TAB(10);"*"
-with-
PRINT "(10 spaces)";"*"

b) replace TAB(W);"*"
-with-
FOR I = 1 TO W-1
PRINT " ";
NEXT I
PRINT "*"

TI-BASIC Does not allow use of DIM statement with string variables. In order to run the programs in this text, simply eliminate the string variables in the DIM statement in each program.

—Does not have string functions needed in order to combine strings. Therefore, the following programs in Chapter 5 cannot be run on the TI:

RHYME
AUTHOR

Radio Shack—TRS-80 Color BASIC Does not use the word LET in assignment statements. Therefore, leave this word out when entering these statements. For example:

Instead of: LET A = B + 1
Use: A = B + 1

HP-2000 BASIC The format for the multiple GOTO statement is different from the one used in the programs in this text.

Instead of: ON X GOTO line #,line#,..etc
Use: GOTO X OF line#,line#,..etc

BREAK KEY Every computer has a break—or program interrupt—key. However, some use a different name, or require a combination of keys. Use the programmer's reference manual included with your computer to determine what it uses. In this text, we have adopted the convention of referring to this key as the break key.

RANDOM NUMBER FUNCTION (RND) The format for this function varies. The Apple, HP-2000, Atari, Osborn and IBM use RND(1), the TRS-80 uses RND(0), and the TI uses RND. The Osborn and IBM computers also require the statement RANDOMIZE in the beginning of the program in order to get a different series of random numbers each time the program is run.

PRINT statement using , (comma) or ; (semicolon) The spacing produced by the , and the ; varies with each version of BASIC. Therefore, some of the programs, such as MVP in Chapter 10, which print a heading and columns of numbers, may not line up on your computer as shown in the sample output. Experiment with your own computer to determine the proper spacing.

IBM BASICA, Osborn CBASIC, BASIC-Plus and Altair Extended Basic These versions of BASIC allow string arrays. The programs in this text use standard BASIC which does not have string arrays. In order to run these programs, leave out the string variables in the DIM statements.

RECTANGLE

You can use the computer to draw lots of shapes. This program draws a rectangle. Use different numbers for the height and width and see what your rectangle looks like.

Try writing a program that draws a triangle.

SAMPLE RUN

```
THIS PROGRAM DRAWS A RECTANGLE
TYPE IN HEIGHT, WIDTH
?10,20
--------------------
*                  *
*                  *
*                  *
*                  *
*                  *
*                  *
*                  *
*                  *
--------------------
```

PROGRAM LISTING

```
100  PRINT "THIS PROGRAM DRAWS A RECTANGLE"
110  PRINT "TYPE IN HEIGHT, WIDTH"
120  INPUT H,W
130  FOR I=1 TO W
140  PRINT "-";
150  NEXT I
160  PRINT
170  FOR I=1 TO H-2
180  PRINT "*";TAB(W-1);"*"
190  NEXT I
200  FOR I=1 TO W
210  PRINT "-";
220  NEXT I
230  END
```

Note: Line 140: The ; tells the computer to remain on the same print line. Try changing the , to a ; and see what happens.

Line 180: This TAB function tells the computer to print the next * in column (W-1).

VARIABLE LIST

H—Height of rectangle
W—Width of rectangle

COMPUTER NOTES

Atari BASIC Does not have the TAB function. Appendix A describes a method of converting these programs for the Atari.

YEAR 2000

How old will you be in the year 2000? How old will your best friend be? You can use this program to find out.

How would you change this program if you wanted to know your age in the year 2025?

SAMPLE RUN

```
FIND OUT HOW OLD YOU WILL BE IN THE YEAR 2000

HOW OLD ARE YOU NOW?12
WHAT YEAR IS IT NOW?1982
IN THE YEAR 2000, YOU WILL BE  30

HOW OLD ARE YOU NOW?35
WHAT YEAR IS IT NOW?1982
IN THE YEAR 2000, YOU WILL BE  53
```

PROGRAM LISTING

```
100  PRINT "FIND OUT HOW OLD YOU WILL BE IN THE YEAR
     2000"
120  PRINT
130  PRINT "HOW OLD ARE YOU NOW";
140  INPUT A
150  PRINT "WHAT YEAR IS IT NOW";
160  INPUT Y
170  REM**HOW CALCULATE THE NUMBER OF YEARS
180  LET T=2000-Y+A
190  PRINT "IN THE YEAR 2000, YOU WILL BE ";T
200  GOTO 120
210  END
```

VARIABLE LIST

A—Your age now
Y—Current year
T—Your age in the year 2000

COUNTING

This program counts by 2's. Hit your computer's break key to stop the program.

See if you can change it to count by 5's.

SAMPLE RUN

```
I CAN COUNT BY 2
 2
 4
 6
 8
 10
 12
 14
 16
 18
 20
 22
 24
 26
 28
 30
```

PROGRAM LISTING

```
100  PRINT "I CAN COUNT BY 2"
110  LET A=0
115  LET A=A+2
120  PRINT A
125  GOTO 115
130  END
```

Note: Line 110: Starts A at zero.

Line 115: Adds 2 more to A each time the computer returns to that line.

Line 125: Tells the computer to return to line 115 and run through the program again.

RETIREMENT

If you want to earn $900,000 before you retire and you can earn $50,000 a year, how many years will you have to work before you can retire? This program gives you the answer.

Suppose you want to earn $1,500,000. Can you change the program to give you the right answer?

SAMPLE RUN

```
IF YOU EARN $ 50000.      PER YEAR
YOU WILL HAVE TO WORK FOR 18    YEARS
IN ORDER TO EARN $ 900000.
```

PROGRAM LISTING

```
100  LET A=900000.
110  LET B=50000.
120  LET C=A/B
130  PRINT "IF YOU EARN $"B" PER YEAR"
140  PRINT "YOU WILL HAVE TO WORK FOR "C" YEARS"
150  PRINT "IN ORDER TO EARN $ "A
160  END
```

Note: Line 120: The symbol / tells the computer to divide.

VARIABLE LIST

A—Total amount you want to earn
B—Amount you can earn each year
C—Number of years you must work

POEM

You can turn your favorite poem into a computer program. Then, whenever you want to read your poem, just run your program.

Here is a poem we wrote. Put this in your computer by typing each line exactly as shown in the Program Listing.

Once you have our poem working on your computer, try writing one of your own.

SAMPLE RUN

```
ROSES ARE RED
VIOLETS ARE BLUE
YOU CAN LEARN TO WRITE PROGRAMS
FOR MOST THINGS YOU DO
```

PROGRAM LISTING

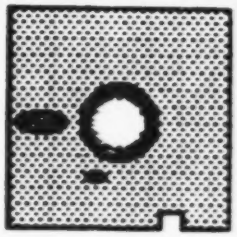
```
100  PRINT "ROSES ARE RED"
110  PRINT "VIOLETS ARE BLUE"
120  PRINT "YOU CAN LEARN TO WRITE PROGRAMS"
130  PRINT "FOR MOST THINGS YOU DO"
140  END
```

Note: Lines 100-130: When this program is run, the computer prints out every letter between the two " marks on each line.

Line 140: The end statement tells the computer that it is the last line in the program. This statement is required for some computers and optional for others. We have included it in this text so the programs can be used on most computers.

SOFTWARE

EVALUATION



Software Evaluation

Before you rush out to buy a computer program, there are some important questions you need to ask.

First of all, is the program written for your machine? Is the program in a format you can use? (i.e. disk, cassette.) How much memory does the program require? Can you get a copy of the disk if the original is damaged? Are the instructions for how to use the program clear and easy to understand?

Much of the software you will want to use has probably already been reviewed by people you know or by magazines. In this case, it is easy to go by their recommendations. We have enclosed some software reviews in this section so you can see the type of criteria they use in review.

If the software program you want to use has not been reviewed, then you will need to review it yourself. We have enclosed some software (and hardware) evaluations also in this section.

Don't overlook those programs known as public domain software. These programs are available to the public free of charge.

SOFTWARE EVALUATION FORM _____

Overall Evaluation

___ **EXCELLENT** program.
Recommend without hesitation.
___ **PRETTY GOOD** program.
Consider purchase.
___ **FAIR** but might want to wait
for something better.
___ **NOT USEFUL** Do not
recommend purchase.

General Information

Program Title: _____

Package Title: _____

Publisher: _____

Copyright Date: _____

Microcomputer (brand, model, memory): _____

Medium (disk, cartridge, tape): _____

Necessary Peripherals or Accessories (e.g., joy sticks): _____

Program Overview and Description

1. Subject/Curriculum Area _____

2. Topic/Objectives Covered _____

_____

3. Appropriate Grade Level(s) (circle)

K 1 2 3 4 5 6 7 8 9 10 11 12 Remedial On Grade Level Enrichment

4. Type of program

____ Drill and Practice
____ Tutorial
____ Simulation
____ Educational Game
____ Authoring System
____ Classroom Management *(specify type below)*
_____
____ Other *(specify type below)*
_____

5. Briefly describe the program, mentioning any special strengths or weaknesses.

_____

_____

_____

6. Are the program's objectives educationally sound? Are they achieved? Briefly explain. _____

_____

_____

EVALUATION CHECKLIST

Please answer Yes, No, or Not Applicable for each question below. To add information or to clarify an answer, use Comments at the end of each section.

Educational Content	**YES**	**NO**	**N/A**
1. Is the program's instructional content accurate?	_____	_____	_____
2. Is the program's content appropriate for the intended users?	_____	_____	_____
3. Is the difficulty level of the content (including vocabulary) appropriate for the intended users?	_____	_____	_____
4. Is the program free of racial, sexual, or political bias?	_____	_____	_____

Comments _____

_____

Presentation			
1. Are the instructions clear and easy to follow?	_____	_____	_____
2. Is the frame display clear and easy to read?	_____	_____	_____
3. Do graphics, sound, and color, if used, enhance the instructional presentation?	_____	_____	_____
4. Is the program free of technical problems?	_____	_____	_____

Comments _____

_____

Interaction

1. Can students control the pace of the material? _____ _____ _____
2. Is the feedback effective and appropriate? _____ _____ _____
3. Can students access the menu for help or to change activities? _____ _____ _____
4. Does the program include good error handling capabilities? _____ _____ _____

Comments: _____

_____

Teacher Use

1. Is record-keeping possible (within the program or through documentation worksheets)? _____ _____ _____
2. Can the teacher modify or add to the content of the program? _____ _____ _____
3. Is the documentation clear and comprehensive? _____ _____ _____

Comments: _____

_____

Reviewer's Name: _____

Date of Review: _____

SOFTWARE EVALUATION CHECKLIST

PROGRAM NAME: Word Attack SOURCE: Davidson & Associates COST: $42.95
SUBJECT AREA: Language Arts REVIEWER'S NAME: _____ DATE: July 24, 19

To teach students new words, meanings & their usages

1 INSTRUCTIONAL RANGE
Levels 1-9, grade 4-12 grade level(s)
average ability level(s)

2. INSTRUCTIONAL GROUPING FOR PROGRAM USE
✓ individual
___ small group (size: ___)
___ large group (size ___)

3. EXECUTION TIME
_____ minutes (estimated) for average use

4. PROGRAM USE(S)
✓ drill or practice
✓ tutorial
___ simulation
___ instructional gaming
___ problem solving
✓ informational
✓ other (can add own word list to data bank

5. USER ORIENTATION: INSTRUCTOR'S POINT OF VIEW

low				high	
·	·	·	⊙	·	flexibility
⊙	·	·	·	·	freedom from need to intervene or assist

6. USER ORIENTATION: STUDENT'S POINT OF VIEW

low				high	
·	·	·	·	⊙	quality of directions (clarity)
·	·	·	·	⊙	quality of output (content and tone)
·	·	·	·	⊙	quality of screen formatting
·	·	·	·	⊙	freedom from need for external information
·	·	·	·	⊙	freedom from disruption by system errors
·	·	·	·	⊙	simplicity of user input

7. CONTENT

low				high	
·	·	·	⊙	·	instructional locus
·	·	·	⊙	·	instructional significance
·	·	·	⊙	·	soundness or validity
·	·	·	·	⊙	compatibility with other materials used

8. MOTIVATION AND INSTRUCTIONAL STYLE

passive				active	
·	·	⊙	·	·	type of student involvement

low				high	
·	·	·	⊙	·	degree of student control

none	poor			good	
·	·	⊙	·	·	use of game format
·	·	·	⊙	·	use of still graphics
·	·	·	⊙	·	use of animation
⊙	·	·	·	·	use of color
⊙	·	·	·	·	use of voice input and output
·	·	·	·	⊙	use of nonvoice audio
⊙	·	·	·	·	use of light pen
⊙	·	·	·	·	use of ancillary materials
·	·	·	·	·	use of printer - can print your store + review words missed

9 SOCIAL CHARACTERISTICS

present and negative	not present	present and positive	
___	✓	___	competition
___	✓	___	cooperation
___	___	✓	humanizing of computer
___	✓	___	moral issues or value judgments
___	___	✓	summary of student performance

1. The grade levels and ability levels for a particular program are primarily determined by the concepts involved. Other important factors are reading level, prerequisite skills, degree of student control, and intended instructional use. It is possible for a program to be flexible enough to be used across a wide range of grade levels and ability levels.

2. Some programs are designed for use by individuals. Others have been or can be modified for participation by two or three persons at a time. Simulations or demonstrations often pose opportunities for large-group interaction. A given program may be used in more than one grouping, depending on the instructor.

3. The time required for the use of a program will vary considerably. Include loading time for cassettes. A time range is the appropriate response here.

4. Instructional programs can be categorized according to their uses. Some programs may have more than one use, thus falling into more than one of the following categories:

Drill or practice: Assumes that the concept or skill has been taught previously.

Tutorial: Directs the full cycle of the instructional process; a dialogue between the student and the computer.

Simulation: Models selected, alterable aspects of an environment.

Instructional gaming: Involves random events and the pursuit of a winning strategy.

Problem solving: Uses general algorithms common to one or more problems.

Informational: Generates information (data).

5. These are factors relevant to the actual use of the program from the point of view of an instructor.

Flexibility: A program may allow the user or the instructor to adjust the program to different ability levels, degrees of difficulty, or concepts.

Intervention or assistance: A rating of "low" means considerable teacher intervention or assistance is required.

6. These are factors relevant to the actual use of the program from the point of view of a student.

Directions: The directions should be complete, readable, under the user's control (e.g., should not scroll off the screen until understood), and use appropriate examples.

Output: Program responses should be readable, understandable, and complete. If in response to student input, the output should be of an acceptable tone and consistent with the input request.

Screen formatting: The formats during a program run should not be distracting or cluttered. Labels and symbols should be meaningful within the given context.

External information: A program may require the user to have access to information other than that provided within it. This may include prerequisite content knowledge or knowledge of conventions used by the program designer as well as maps, books, models, and so on.

System errors: System errors result in the involuntary termination of the program.

Input: A program should ensure that a user knows when and in what form input is needed. It should avoid using characters with special meanings, restrict input locations to particular screen areas, and require minimal typing.

7. These are matters relevant to the subject-matter content of the program.

Focus: The program topic should be clearly defined and of a scope that permits thorough treatment.

Significance: The instructional objectives of the program must be viewed as important by the instructor. Also, the program should represent a valid use of the computer's capabilities while improving the instructional process.

Soundness or validity: The concepts and terms employed should be correct, clear, and precise. Other important factors are the rate of presentation, degree of difficulty, and internal consistency.

Compatibility: The content, terminology, teaching style, and educational philosophy of the program should be consistent with those generally encountered by the student.

8. Competition, cooperation, and values are concerns that may be a function of the way a program expresses them. (War gaming and the "hangman" format are sample issues.) Also, the "humanizing" of the computer may serve for motivation or to reduce anxiety, but it also may become tedious, misleading, and counterproductive.

The summary of student performance can be dichotomous (win or lose), statistical (time expended or percent of items correct), or subjective (as in the evaluation of a simulation). It may be for student, teacher, or both.

SOFTWARE EVALUATION FORM

Name of Program _____

Topic _____ Source _____

Computer _____ Tape _____ Disk _____ Other Equipment _____

Memory Required _____ Language _____ Cost _____

CLASSIFICATION OF PROGRAM

_____ Drill & Practive _____ Simulation _____ Game _____ Tutorial _____ Testing

_____ Computer Managed Instruction _____ Text Editing _____ Problem Solving

Age Level _____ Objectives _____

_____

_____

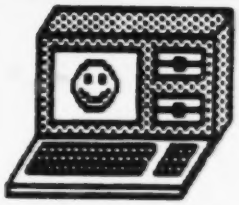
EVALUATION OF INTRODUCTION & INSTRUCTIONS	YES	NO	NOT APPLICABLE
Clear and Well-formated Introduction	_____	_____	_____
Presentation Suitable to Grade Level	_____	_____	_____
Clear and Complete Instructions	_____	_____	_____
Presentation Suitable to Objectives	_____	_____	_____

Additional Comments _____

_____

EVALUATION OF PROGRAM			
Randomization	_____	_____	_____
Branching	_____	_____	_____
Immediate & Approprate Feedback	_____	_____	_____
Personalized Reinforcement	_____	_____	_____
Graphics Appropriately Used	_____	_____	_____
Scores and/or Progress Reported	_____	_____	_____
Student Control	_____	_____	_____
Objective(s) Accomplished	_____	_____	_____
Support Material Available	_____	_____	_____
Interaction Evident & Appropriate	_____	_____	_____

Additional Comments _____



Checkpoints for Evaluating Software:

Design:

1. Is the program for individual or group use?
2. Is it more appropriate for remedial, gifted, or special-needs students?
3. Are the rate of presentation and degree(s) of difficulty appropriate for the intended audience?
4. Does it treat different learners in different ways?
5. Is the length too long to maintain interest or too short to cover the subject well?
6. Is text presented in small, easy-to-read blocks?
7. Do the graphics and sound contribute to the program, or are they ancillary or even distracting?
8. Is the information presented in a variety of formats?
9. Does it offer flexibility in use by permitting you to adjust it to serve different concepts (e.g. subtraction as well as addition) and different degrees of difficulty (e.g., the numbers from 10-50 as well as those from 0-9)?
10. Does the program allow for interactive use of the microcomputer?
11. Does the user have any control over the rate of presentation or the level of difficulty of the examples?
12. Will management components really make your job easier?
13. Can it be executed by a student without the need for your assistance in interpreting directions, responses, or graphic displays?
14. Is there a constant "dialogue" between program and user?
15. Is the program difficult to use?
16. Does it load properly and without errors?

17. Are the instructions clear?

18. Can the user get help by returning to instructions or content material?

19. Does the program clearly indicate when and in what form a user should enter a response?

20. Do errors in use of the keyboard cause unintentional termination of the program?

21. Are inherent elements of competition, cooperation, or social values appropriate for the audience?

Content:

1. Is the program pedagogically sound?

2. Is the content correct?

3. Is the spelling correct?

4. Is each instructional objective clear and appropriate for its learning level?

5. Is the level of presentation consistent throughout the program?

6. If the program will reinforce material already discussed, is the presentation consistent with your presentation of the skill or concept?

7. Could a workbook do the same job? If so, is the computerized version worth the price?

8. Do any good support materials come to mind when viewing the program?

9. Is the treatment of right and wrong answers suitable?

10. Is the computer's reaction to right answers more appealing than its reaction to wrong?

11. Will kids like the program?

12. Do you like the program?

STUDENT OBSERVATION OF MICROCOMPUTER COURSEWARE USE

Student Name: _____ Courseware Program: _____

Grade: _____ Section/Level Used: _____

Age: _____ Date: _____

I. Physical Environment Information

Describe physical layout of the classroom including: where the computers are located; where the students are seated; and where the teacher(s) is (are) located. Use the following symbols:

/C/= Computer /_/= Desks X= Student T=Teacher [ ]= Blackboard

Comments: _____

_____

_____

_____

_____

_____

II. Ease of Use of Courseware Program

Student Checklist	Yes	Somewhat	No
1. Student has a problem manipulating the keyboard.	___	_____	___
Comments: _____			
_____			
2. Program holds student attention.	___	_____	___
Comments: _____			
_____			
3. Student has a problem following program's directions.	___	_____	___
Comments: _____			

	Yes	Somewhat	No
4. Student is self-sufficient and is not asking teacher many questions after initial introduction.	___	_____	___

Comments: _____

_____

5. Student has a problem reading the screen. ___ _____ ___

IV. Student Questionnaire

1. Did you like this program? _____ Why or why not? _____

_____

2. Did you learn anything from it? _____ What did you learn (or why didn't you learn)? _____

_____

3. Could you follow the instructions all the time? _____

_____

4. Would you want to use this program again? _____ Why or why not? _____

_____

5. Did you like using the microcomputer? _____ Why or why not? _____

_____

6. What did you think of the graphics/pictures (if there were any)? _____

_____

7. Did you find the screen easy to read? _____

III. Teacher Questionnaire

1. What type of student is this? _____

2. Does he/she do well in _____ subject area? _____

3. What are his/her strengths? _____

Weaknesses? _____

EVALUATION CHECKLIST

Please check Yes, No or Not Applicable for each question below. To add information or to clarify an answer, use Comments at the end of each section.

EDUCATIONAL CONTENT	YES	NO	N/A
1. Is the program's instructional content accurate?	___	___	___
2. Is the program's content appropriate for the intended users?	___	___	___
3. Is the difficulty level of the content (including the vocabulary) appropriate for the intended users?	___	___	___
4. Is the program free of racial, sexual, or political bias?	___	___	___

Comments: _____
_____

Presentation

1. Are the instuctions easy to follow?	___	___	___
2. Is the frame display clear and easy to read?	___	___	___
3. Do graphics, sound, and color (if used) enhance the instructional presentation?	___	___	___
4. Is the program free of technical problems?	___	___	___

Comments: _____
_____
_____

Interaction

1. Can students control the pace of the material? ___ ___ ___

2. Is the feedback effective and appropriate? ___ ___ ___

3. Can the students access the menu for help or to change activities? ___ ___ ___

4. Does the program include good error handling capabilities? ___ ___ ___

Comments: _____
_____

Teacher Use

1. Is record-keeping possible (within the program or through documentation worksheets)? ___ ___ ___

2. Can the teacher modify or add to the content of the program? ___ ___ ___

3. Is the documentation clear and comprehensive? ___ ___ ___

Comments: _____
_____

REVIEWER'S NAME: _____

DATE OF REVIEW: _____

–Evaluating Hardware

Our Optimum System

Memory desired? _____ Storage desired? _____
Potential desired for expansion? _____ Color desired? _____
Graphics capability desired? _____ High quality sound desired? _____
Software with which compatibility is desired _____

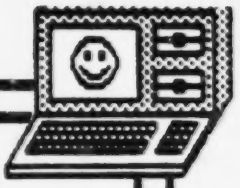
Number of microcomputers desired? _____
Number of monitors desired? Color _____ B/W _____
Number of printers desired? Dot Matrix _____ Daisy Wheel _____ Plotters _____
Our Budget _____

COMPUTERS CONSIDERED

Name of Microcomputer
Memory capacity? _____ Potential for expansion? _____
Type of storage recommended? Cassette _____ Disk _____
Monitor? Integral to micro _____ Separate _____ Color _____ B/W _____ TV _____
Compatibility with desired software? _____
Rate the quality of the following 1-4 from worst to best:
Sound _____ Color _____ Graphics _____
Kind of printer with which computer is compatible _____
Cost per unit? Microcomputer _____ Monitor _____
Storage units _____ Printer _____
Total per package _____

Name of Microcomputer
Memory capacity? _____ Potential for expansion? _____
Type of storage recommended? Cassette _____ Disk _____
Monitor? Integral to micro _____ Separate _____ Color _____ B/W _____ TV _____
Compatibility with desired software? _____
Rate the quality of the following 1-4 from worst to best:
Sound _____ Color _____ Graphics _____
Kind of printer with which computer is compatible _____
Cost per unit? Microcomputer _____ Monitor _____
Storage units _____ Printer _____
Total per package _____

Name of Microcomputer
Memory capacity? _____ Potential for expansion? _____
Type of storage recommended? Cassette _____ Disk _____
Monitor? Integral to micro _____ Separate _____ Color _____ B/W _____ TV _____
Compatibility with desired software? _____
Rate the quality of the following 1-4 from worst to best
Sound _____ Color _____ Graphics _____
Kind of printer with which computer is compatible _____
Cost per unit? Microcomputer _____ Monitor _____
Storage units _____ Printer _____
Total per package _____



1 What equipment is included in the total price of the computer?
Determine whether the cost includes only the terminal (the keyboard with the computer's memory inside) or the terminal, monitor (the screen) and disk drive in one unit.

2 If the price doesn't include the disk drive, how much more will that cost me?
A disk drive can cost more than the computer. You can get started with a cheaper tape cassette, but you may soon find it too slow and limited. Disks are far more efficient and costly. A computer that comes with a dual disk drive may be cheaper than a terminal for which you must buy a separate dual disk drive.

3 If the cost of a monitor is not included, can I use the computer easily with a regular television screen?
Many computers can be hooked up to your TV screen. But, check the price and quality of a monitor; you may want to buy this equipment later.

4 What is the personal computer's memory capability?
Today's home computers should have at least 64K memory. These models can be purchased for $300–$500.

5 How much do the compatible printers cost?
You will doubtless want a printer eventually; without one, you have no record of your work on paper. Ask to see a demonstration, and check the quality and cost of both a letter-quality printer (like typewritten letters) and a dot-matrix printer (computer letters formed from dots). If you only want to print out programs, an inexpensive dot-matrix printer may be adequate. However, if you plan to send out letters, you probably will want a letter-quality printer. Also check the manual that comes with the printer to find out how easy it is to change the ribbon. Look into whether you can change the type of print by a daisy wheel or some other device, and ask what width of paper to use.

6 What is the computer's word processing like?
Try the keyboard for size and personal preference. Check the prices of different word processing packages; quality varies. Find out whether it has an 80-character count per line (the spaces across the computer). If it doesn't, be sure you can at least print in 80 characters. It's not difficult to adjust a 40-character screen to print in an 80-character width. The word processing program should allow you as much screen space as possible for working, with no more than two lines taken up by program guides.

7 What kinds of software are available for this computer?
The computer programs are just as important as the computer itself. When trying out a computer, find out what software is being demonstrated on the

machine. You may like the software more than the computer. Try a couple of computers using the same software to determine subtle differences in the machines. If you have children, you will want to be able to buy suitable software to run on the computer. Compare prices of games and software you need. Then make your decision based on both the machine and its software capabilities.

8 Does your store offer any help with installment or the setting up of the computer?
Ask to see computer manuals that explain installation and use—and decide whether you can follow the directions. If not, find out whether the salesperson will be available.

MICROCOMPUTER HARDWARE EVALUATION FORM

Microcomputer Model_____ Manufacturer_____

Dealer_____ Phone_____

Memory Size_____ Expandable to_____ Languages_____

Cost_____ Basic Components_____

Graphics_____ Text_____ Upper/Lower Case_____

Screen Size_____ Storage (Cassette or Disk)_____ Cost_____

Special Features: (voice, color, music)_____

RATE	Poor		Average			Excellent
Video Display Quality	0	1	2	3	4	5
Base of Use: Portability & arrangement of components	0	1	2	3	4	5
Documentation: Readability, Organization	0	1	2	3	4	5
Peripheral Support	0	1	2	3	4	5
Service & Repair: Local, Proximity & Cost	0	1	2	3	4	5
User Training	0	1	2	3	4	5
Warranty Length	0	1	2	3	4	5
Execution Time	0	1	2	3	4	5
Reliability & Sturdiness	0	1	2	3	4	5
Editing Capability & Ease	0	1	2	3	4	5
Amount of Software	0	1	2	3	4	5
Suitability of Equipment to Meet Instructional Needs	0	1	2	3	4	5

Programming___ Text Editing___ Computer Literacy___ Testing____

Computer Assisted Instruction___ Computer Managed Instruction_____

Information Management____

Comments:

Total Points Evaluator

151

HOW TO LOAD SOFTWARE

APPLE II Plus,IIe, AND IIc
Step 1: Turn on the monitor. *(The knob is located on the front of the monitor on the right side.)*
Step 2: Open the door on the disk drive.
Step 3: Slide in the diskette, making sure the label faces up and goes in last. You will hear a click when it is in place.
Step 4: Close the door on the disk drive.
Step 5: Turn on the microcomputer. *(The switch is on the back of the keyboard on the left side.)* You will hear a beep. The disk drive will hum and the red "In Use" light will come on temporarily. **Caution:** *Do not insert or remove a disk while the drive is humming or while the red "In Use" light is on.*
Step 6: Commercially prepared software may "boot" automatically. If it doesn't, wait for the monitor prompt and type: RUN and the name of the program. For example: RUN STARFIND

ATARI 400 or 800
For cartridges
Step 1: Load BASIC
Step 2: Pull the lever on the cartridge cage door on top of the computer that is marked "Pull Open."
Step 3: After checking cartridge label to make sure you are inserting the right side up, push the cartridge firmly into the slot until it clicks.
Step 4: Close the cage door.
Step 5: Turn on the monitor.
Step 6: Turn on the monitor. Step 7: Turn on the computer. *(The switch is on the right side of the keyboard.)* Step 8: Press START, then SYSTEM RESET. Step 9: Press SELECT to display options. Step 10: Press OPTION to enter options selected. Step 11: Press START.

Step 1: Make sure the computer is turned OFF.
Step 2: Insert the BASIC cartridge into the cage at the top of the computer and close the cage door. Step 3:Turn on the monitor, then the disk drive. Step 4: Turn on the disk drive and wait for the humming to stop and the light to go out.
Step 5: Carefully slide the diskette onto the drive, making sure that the label is on top and goes in last. Close the diskette cage door.
Step 6: Turn on the computer and wait for the diskette to load. When the light goes out and the drive stops humming, the disk drives stops humming, the diskette will be loaded. Step 7: Follow the instructions on the monitor screen.

COMMODORE PET
For tapes
Step 1: Turn on the microcomputer. *(The switch is on the back of the keyboard on the left side.)*
Step 2: Place the cassette in the player and rewind the tape.
Step 3: Type LOAD and press the RETURN key.
Step 4: The computer will instruct you to press the PLAY key on TAPE 1.
Step 5: The monitor will display the following sequence:
SEARCHING
FOUND
LOADING
READY
The cursor will then flash.
Step 6: Type RUN and press the RETURN key. Follow instructions on the monitor screen.

For diskettes
Step 1: Turn on the microcomputer and the dual disk drive. *(The switches are located on the back of the machine on the right side.)*
Step 2: Open the door on the disk drive, and gently slide the disk into place. The label should face up, toward you.
Step 3: Close the door.
Step 4: Type LOAD $,8 and press the return key. (Programs vary greatly. If this command fails to work, look for an accompanying manual.)
Step 5: Type LIST and press the RETURN key to see a listing of all programs stored on the disk.
Step 6: Type LIST and press the return key to see all the programs on the diskette.
Step 7: Type LOAD "PROGRAM NAME",8 and press RETURN.
Step 8: The program will load. Type RUN and RETURN.

COMMODORE 64

For cartridges

Step 1: Make sure your microcomputer is OFF.
Step 2: Turn on monitor or TV.
Step 3: Insert cartridge.
Step 4: Turn on microcomputer.
Step 5: Type START.
Caution: Do not move cartridges in or out of the computer while it is on. To do so will damage the program.

For cassettes

Step 1: Make sure cassette is rewound before you begin.
Step 2: Turn on the microcomputer and type LOAD.
Step 3: The monitor will respond PRESS PLAY ON TAPE.
Step 4: Press Play on your cassette machine.
Step 5: The monitor will go blank for a minute until it finds the program. Then it will read FOUND PROGRAM (by name).
Step 6: Press the Commodore key.

For diskettes

Step 1: Turn on the monitor, the disk drive and *always last* the microcomputer.
Step 2: Open the door on disk drive and gently slide the disk into place. The label should be on top, facing you.
Step 3: Close the lever over the inserted disk.
Step 4: Type LOAD "PROGRAM NAME",8 press RETURN.
Step 5: Wait for the program to stop humming and the word READY to appear on your screen.
Step 6: Type RUN.

IBM PC and PC Jr.

For diskettes

Read instructions carefully. Some software comes with specific instructions which you must follow specifically. Other software is formatted to load in the following way.
Step 1: Slide disk with the label facing up, toward you. Close drive.
Step 2: Turn on the computer. The program will "boot" automatically.

IBM PC Jr

For cartridges

Step 1: Turn on the monitor, then the microcomputer.
Step 2: Push cartridge firmly into one of the two cartridge slots.
Step 3: Program will "boot" automatically.

Texas Instrument 99/4A

For modules

Step 1: Turn on the monitor *(the knob on the front, right,)* then the microcomputer *(the sliding switch on the front, right)*
Step 2: An introduction screen will appear on the monitor.
Step 3: Push the module firmly into the slot at the right of the keys.
Step 4: Press any key.
Step 5: Select the number of the program you wish to run and enter it on the keyboard. Follow the instructions that appear.

TRS-80 COLOR COMPUTER

For Tapes

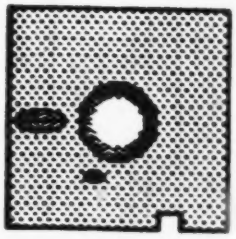
Step 1: Push the power button at the back of the computer to turn it on. *(It is located at the left of the wires.)*
Step 2: The monitor screen will light up. Press the ENTER key until it responds with READY.
Step 3: Connect the cassette player to the microcomputer.
Step 4: Turn on the cassette player and rewind the tape.
Step 5: Type CLOAD and press the ENTER key.
Step 6: Press PLAY on the recorder.
Step 7: The monitor will display the following sequence: "S" PROGRAM NAME OK
The cursor will the flash.
Step 8: Type RUN and press the ENTER key.

TRS-80 COLOR COMPUTER and LEVEL III

For diskettes

Step 1: Turn on the microcomputer. *(The switch is under the keyboard on the right edge.)*
Step 2: Open the cage door of the disk drive.
Step 3: Slide the diskette into the slot with the label on top toward you.
Step 4: Close the cage door.
Step 5: Press the square orange RESET button on the right of the keyboard.
Step 6: As the microcomputer loads the program, the disk will hum and the light will come on. Then a catalog will appear on the screen.
Step 7: Type LOAD "PROGRAM NAME"

Software Best Sellers



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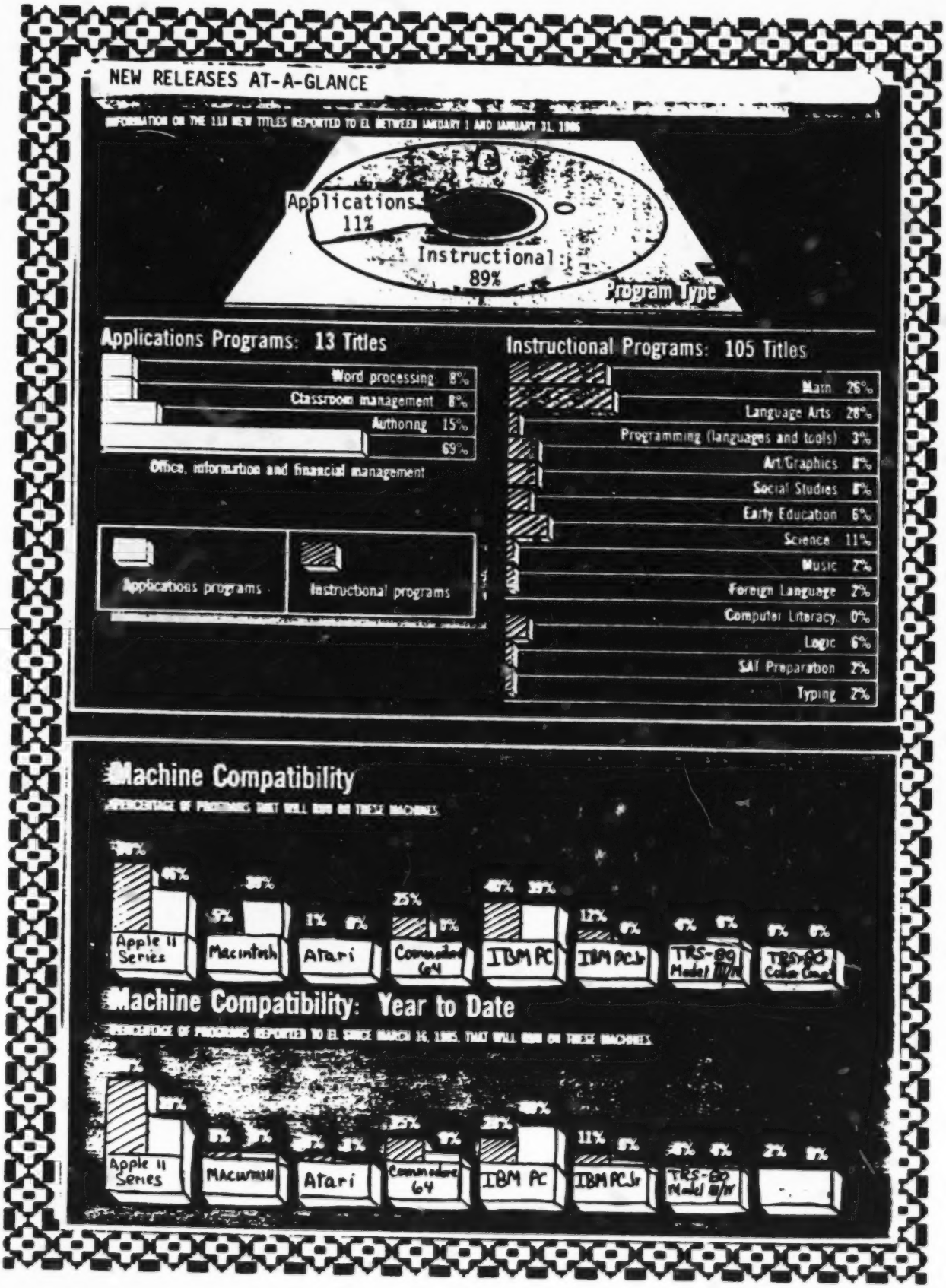
April

This Month	Last Month	Title	Publisher	Remarks	Systems: Apple	Atari	Commodore	IBM	Macintosh
Entertainment									
1	1	*Ultima IV*	Origin Systems inc	Fantasy game	•	•	•		
2		*Gato*	Spectrum Holobyte	Submarine simulation	•		•	•	•
3		*Hardball*	Accolade	Baseball game	•		•		
4		*Bard's Tale*	Electronic Arts	Fantasy/role-playing game	•		•		
5		*Flight Simulator*	Microsoft	Aircraft simulation				•	
Education									
1	2	*Math Blaster!*	Davidson	introductory math program, ages 6-12	•	•	•	•	
2	1	*Typing Tutor III*	Simon & Schuster	Typing instruction program	•		•	•	•
3	4	*New Improved MasterType*	Scarborough	Typing instruction program	•	•	•	•	•
4	3	*Music Construction Set*	Electronic Arts	Music composition program	•	•	•		
5		*Homework Helper: Math Word Problems*	Spinnaker	Math tutorial, high school level	•	•	•	•	
Home Management									
1	1	*Print Shop*	Broderbund	Do-it-yourself print shop	•	•	•		
2	2	*The Newsroom*	Springboard	Do-it-yourself newspaper	•		•	•	
3	5	*Swiftax*	Timeworks	Tax preparation program	•		•	•	
4	4	*Print Shop Graphics Library*	Broderbund	100 additional graphics	•	•	•		
5		*Paperback Writer*	Digital Solutions	Word processing program			•		

March

This Month	Last Month	Title	Publisher	Remarks	Apple	Atari	Commodore	IBM	Macintosh
Entertainment									
1	3	*Ultima IV*	Origin Systems	Fantasy game	•	•	•		
2	5	*F-15 Strike Eagle*	MicroProse	Air combat simulation	•	•	•	•	
3	1	*Jet*	SubLogic	Jet simulation			•		
4	4	*Karateka*	Broderbund	Action karate game	•	•	•		
5	2	*Silent Service*	MicroProse	Submarine simulation	•	•	•	•	
Education									
1	1	*Typing Tutor III*	Simon & Schuster	Typing instruction program	•		•	•	•
2	2	*Math Blaster!*	Davidson	introductory math program, ages 6-12	•	•	•	•	
3	4	*Music Construction Set*	Electronic Arts	Music composition program	•	•	•		
4	3	*New Improved MasterType*	Scarborough	Typing instruction program	•	•	•	•	•
5	5	*I Am The C-64*	Creative/ Activision	introduction to the C-64			•		
Home Management									
1	1	*Print Shop*	Broderbund	Do-it-yourself print shop	•	•	•		
2	2	*The Newsroom*	Springboard	Do-it-yourself newspaper	•		•	•	
3	3	*Bank Street Writer*	Broderbund	Word processor	•	•	•	•	
4	5	*Print Shop Graphics Library*	Broderbund	100 additional graphics	•	•	•		
5		*Swiftax*	Timeworks	Tax preparation program	•		•	•	



BEST COPY AVAILABLE

APPLE II

CATEGORY	SOFTWARE
WORD PROCESSING	AppleWorks—*Apple Computer, Inc.*
INFORMATION MGMT.	AppleWorks—*Apple Computer, Inc.*
GRAPHICS	Print Shop—*Broderbund Software*
GAMES	Flight Simulator II—*Sub-Logic Corporation*
EDUCATION	Sticky Bear ABC—*Field Publications*
BUSINESS ACCOUNTING	BPI Accounting—*BPI Systems*
PERSONAL FINANCE	Dollars & Sense—*Monogram*
SPREADSHEET	AppleWorks—*Apple Computer, Inc.*
INTEGRATED	AppleWorks—*Apple Computer, Inc.*
MUSIC	Music Construction Set—*Electronic Arts*
PROJECT MGMT.	Think Tank—*Living Videotext*
UTILITIES	Copy II Plus—*Central Point Software*

SOFTWARE PRICES STABLE

CURRENT SOFTWARE PRICES WILL HOLD AS SCHOOLS BEGIN PURCHASING FOR '86-'87

BETWEEN now and September, as schools make their software purchases for the next school year, school software buyers can expect software prices to remain stable. Despite what Christine Johnston, Director of Marketing for Milliken Software describes as "obvious pressure to reduce prices," and several cases of price cuts in the past year by publishers like CBS, Simon & Schuster, and Sunburst, a spot survey of 20 leading educational software producers finds that most publishers will be selling software in September for the same price they sold it in January.

Almost three-quarters of the 20 publishers contacted by *Electronic Learning*—Apple, Broderbund, Davidson & Associates, DesignWare, EduWare, Encyclopaedia Britannica, K-12 Micromedia, The Learning Company, The Learning Well, MECC, Milliken, Mindscape, Scholastic, Simon & Schuster, and Springboard—will maintain their current prices through September, and many anticipate the same prices through the end of 1986.

Three companies in the survey—Grolier, Spinnaker, and Sunburst—have raised prices on some or all of their software titles in the past two months, and plan to maintain those prices at least through September.

Three additional companies—SVE, Holt, and Educational Activities—have no firm plans yet on their pricing for the next six months.

WHILE schools cannot expect to find cheaper prices on software, at least on individual software titles, they can look for more companies offering deals on volume purchases, or on bundles of software. Grolier, for example, raised the price of its utility packages *EduCalc*, *Friendly Filer*, *Easy Graph*, and *The Information Connection* by 10 percent in February. At the same time, they are offering a bundle of the four utility programs for $189, which is about what three would cost individually.

EDUWARE is selling its six algebra programs as a group called *The Algebra Curriculum Pack* and five of its writing programs together in a group called *The Writing Curriculum Pack*. As a pack, the programs are available at half the price of the individual titles. DesignWare and EduWare also sell assortments of their programs for kindergarten through sixth grade, and fifth through eighth grade.

LAB packs, multiple copies of a single program, which have been widely available this year—24 out of 39 publishers surveyed by *Electronic Learning* in October offered some sort of lab pack—will continue to be available, though publishers will be experimenting with larger packs and different pricing structures. Scholastic, for example, is considering enlarging its packs thus dropping the price per disk of its programs which currently come five copies to the pack. DesignWare has started selling lab packs of 40.

SCHOOLS can also look for more and cheaper site-licensed programs. For example, Logo Computer Systems' new *LogoWriter* program will be available to schools for $395 for as many copies of the program as the school wants to make. For an additional fee of less than $100, schools will also have the right to send copies of the program home with students.

—Tony McGuire
Associate Editor

The Top Five Free Programs For Your Computer

Arlan R. Levitan

Good software doesn't have to be expensive. You can accumulate a respectable software library merely by taking advantage of the thousands of programs in the public domain—that is, programs which are given away free by their authors. Another alternative, the "shareware" concept, lets you test-drive a program for free and make a voluntary contribution if you like. Here's a guide to public domain software and shareware, plus the results of a survey in which users all over the country voted for their top five favorites.

Does the thought of paying more for a program than you laid out for your computer make you grumpy and irascible? Cheer up. There's a wealth of programs available for your computer that cost little or nothing at all. Public domain and shareware programs can provide you with a never-ending supply of grist for your computer's mill.

The idea of public domain software has been around since the early computer hobbyists first started sharing their programs with each other. People would try running each other's programs, suggest improvements, or make the improvements themselves. Few people copyrighted their programs because they were hobbyists rather than software authors trying to make a living. Legally, all it takes to place a program in the public domain is for the author to declare it so. (Of course, this excludes most programs published in magazines and books, which are nearly always copyrighted to protect the authors.)

Public domain programs can be freely exchanged between individuals or distributed by user groups and computer bulletin board systems (BBSs). They come with no warranties, packaging, or customer support. They are gifts to the public and vary in quality from marginal to very good.

To determine which public domain programs are the most popular among users, in April we conducted a survey over three commercial information services: CompuServe, The Source, and Delphi. Below are the results of this informal survey. For each personal computer, we've listed the top five programs. The type of program is identified within parentheses.

We have excluded from consideration programs that are not truly in the public domain, including programs which elicit a fee for documentation, and programs which have been published, are in widespread use, but are definitely not in the public domain—such as COMPUTE!'s own *SpeedScript*, for example.

You'll notice that many of the popular programs on the list are terminal programs. This is probably due to the fact that the survey was conducted online among telecomputing enthusiasts.

To obtain copies of any of these programs, try contacting your local user group or logging onto a BBS or commercial information ser-

vice. Friends and coworkers are also valuable sources for public domain programs.

Another type of freely distributed software that is sometimes confused with public domain software is *shareware* (also called *user-supported software*). The concept of shareware came about as a response to the negative aspects of marketing software commercially.

It seems that almost everybody likes to complain that software is too expensive. Critics of the software industry claim that prices are inflated by a charge-what-the-market-will-bear attitude as the product filters through distribution channels. The manufacturer typically sells to a distributor, who in turn sells to a retailer. Each middleman adds a markup. The author of the software receives only a small percentage of the selling price.

Critics argue that this practice causes a serious problem: The perception of high prices encourages unauthorized duplication of software. This leads to a classic conflict between the manufacturers and the software pirates. Manufacturers may be tempted to boost their prices to make up for expected losses to piracy, and pirates may justify copying because they say prices are unreasonably high.

For these and other reasons, some software authors decide to market their programs themselves. There have been few success stories among those who've tried this approach. The authors attempt to work within the established marketplace, but usually fail because they lack the resources necessary to promote, advertise, and distribute their product.

About four years ago, a programmer named Andrew Fluegelman wrote a terminal program for IBM computers called *PC-Talk III*. To distribute his program, Fluegelman combined aspects of both public domain and commercial software to come up with a new category he called *Freeware*. Freeware is based on three concepts:

- Before buying a program, computer users should have the opportunity to fully assess its value by using it extensively to determine whether it serves their needs.
- Original software of high quality written by independent authors will be supported by the personal computing community.
- Copying of these programs should be *encouraged*, rather than discouraged. The ease of disseminating programs outside traditional commercial channels should be exploited by software authors to maximize distribution.

Fluegelman actually trademarked the term Freeware, so as these ideas spread and other authors began following suit, the term *shareware* was coined for general use. Here's how shareware typically works:

Anyone can get a copy of a shareware program. Usually, you obtain it from a local user group or BBS. Since there is no packaging or manual, any documentation is generally in the form of a text file on the disk or BBS. You must print out a hardcopy if you want a manual for reference purposes.

Shareware programs contain a notice suggesting that you send a certain contribution to the author if you find the program useful. The contribution is voluntary, and even if none is made, you're encouraged to share the program with others.

Although no shareware authors are reported to be making a killing, many are said to be realizing a steady stream of supplemental income.

How good is shareware? The best of it is quite good indeed, and often better suited to the needs and abilities of casual users than more expensive commercial programs. If you're willing to do without fancy manuals and can rely on fellow users for technical support, shareware may be right for you.

Here are the top five freely distributed programs for each popular personal computer. Shareware programs are denoted with an asterisk (*). You'll notice that only four programs are listed for the Commodore 64/128. That's because the other programs which received votes are not truly in the public domain—including two which are copyrighted by COMPUTE!.

[redacted]

[redacted]

[redacted]

[redacted]

Commodore 64/128

Comm Term (Terminal program)
*Haunted Hill (Game)**
Disk Doctor 128 (Utility)
Blue Thunder (Game)

Atari 400/800/XL/XE

AMIS (Bulletin board system)
AMODEM (Terminal program)
MYRIAPEDE (Game)
POKEY Player (Music)
AMENU (Program autoloader)

Atari ST Series

STerminal (Terminal program)
*STCalc (Calculator desk accessory)**
Megaroids (Game)
RMDISK (RAM disk utility)
COPY (File utility for single-drive systems)

Apple II Series

EAMON (Adventure game)
*FreeWriter (Word processor)**
*EVE (Terminal program)**
RAMDISK128 (RAM disk utility)
ABBS (Bulletin board system)

Commodore Amiga

Aterm (Terminal program)
StarTerm (Terminal program)
Mandelbrot (Graphics demo)
Hack (Adventure game)
EMACS (Text editor)

IBM PC/PCjr

MEMBRAIN (RAM disk utility)
*PROCOMM (Terminal program)**
*PC-File (Database manager)**
RBBS (Bulletin board system)
*PC-Write (Word processor)**

Apple Macintosh

*Red Ryder (Terminal program)**
*BINHEX (File conversion utility)**
MazeWars (Game)
VMCO (Vocal/visual terminal program)
ResEdit (Resource editor)

Texas Instruments TI-99/4A

Fast-Term (Terminal program)
Disk Manager 1000 (Disk cataloger)
FUNL Writer (Word processor)
NeatList (Utility)
MassCopy (Utility)

SOFTWARE: SIDE BY SIDE

GRAPHING PROGRAMS

EDITOR'S NOTE: Each month, Software: Side by Side takes a comparative look at different software packages within the content of "Computers in the Curriculum." The packages are reviewed by an educator with extensive educational computing experience. This month's graphing programs for use in math classes are rated on a scale of 1-5 (1 = unsatisfactory, 2 = average, 3 = good, 4 = very good, 5 = excellent).

Readers should realize that this selection of programs does not represent the entire spectrum of software available.

PROGRAM/ PRICE/ SOURCE/ COPYRIGHT	COMPUTERS	LEVEL/ DESCRIPTION	Instructional Design	Content	Appropriateness	Interest Level	Ease of Use	Support Materials	Overall Value	REVIEWER'S COMMENTS/ PUBLISHER'S RESPONSE
Superplot **$49.95** (EduSoft Educational Software, PO Box 2560, Berkeley, CA 94702) 1985	Apple II family (64K)	**Grades 8-12** Plots up to five polynomial, trignometric, logarithmic, or exponential functions. Allows scrolling and zooming in or out either axis or on both axes simultaneously. Has optional sound and color. User can change graph limits.	5	5	5	4	4	4	4	**Reviewer's Comments:** *Superplot* is a very good program and would be exellent for demonstrations where a large color monitor is available. The use of standard algebraic notation with raised exponents seems natural. The display of the equations color-coded to the graphs and the on-line help are very helpful features. Program would even be more useful if the graphs could be printed or saved. Having a site-license allowing legal multiple copies or networking for only an additional $35 is a real plus. ***Publisher's Response:*** *We plan to add both saving and printing features in late Spring '86. Program is also good for individual student investigation.*
Graphing **$39** (MECC, 3490 Lexington Ave. N., St. Paul, MN 55112) 1984	Commodore 64, Apple II family (48K), TRS-80 Color 32K, Atari	**Grades 7-12** Three graphing programs, one simulation, and an educational game in which students try to locate a "snark" hidden on a grid by entering a center and the radius of a circle. Includes a 56-page manual. Not all machine versions allow printing and saving.	4	4	3	3	2	5	2	**Reviewer's Comments:** This program has a superb support manual. *Snark* is a good game to develop logic and visualization skills. Although the color test works perfectly, the equations were not graphed in color. *Polygraph* has a great deal of flexibility, allowing students to choose the scale, zoom in, or expand. In all three graphing programs, equations must be entered in a form similar to that of BASIC rather than standard notation. ***Publisher's Response:*** *Publisher has no response.*

Reviewed by Dr. Margie Mason, Assistant Professor, Department of Mathematics, Northern Illinois University, DeKalb, IL.

Graphing Equations (Including Green Globs) **$60** (Conduit, The University of Iowa, Oakdale Campus, Iowa City, IA 52242) 1983	Apple II family (48K)	**Grades 7-12** A four-program package that includes two game programs and a utility program that graphs functions entered by students. Graphing program gives students guided practice in determining the equation of straight lines, parabolas, circles, ellipses, or hyperbolas. User cannot save and print graphs.	5	5	5	5			5	**Reviewer's Comments:** *Green Globs* is a classic game that teaches students to draw graphs. It really promotes higher-level thinking and can be used successfully by students at various levels of sophistication. The top scoring game replay feature promotes exploration and allows students to see the strategies others have used. Warning: *Green Blobs* is addictive! *Linear & Quadratic Graphs* provides excellent drill with a great deal of flexibility on determining graphs of various functions. *Tracker* is an excellent game for developing logic and visualization skills. ***Publisher's Response:*** *Publisher has no response.*
							4	4		
Graphing Exponential Functions **$29.95** (Educational Activities Inc., PO Box 392, Freeport, NY 11520) 1983	Apple II family (48K), TRS-80 Model III/4, Commodore PET	**Grades 7-12** Contains a tutorial on functions in the form Y = A and a section where students enter their own values for A and X and see the resulting graphs. Maintains records for up to 50 students. User cannot save or print graphs.								**Reviewer's Comments:** This program is useful for teaching about only one type of function—Y = A. If students attempt to repeat a section, the message "Please get your teacher," will appear. According to the documentation, the teacher is then supposed to press Control and A on the Apple to continue. However, this reviewer was never able to get this feature to function. The CAPS LOCK key must be depressed on the IIe and IIc for any input to be accepted, but neither the program nor the manual mentions this. ***Publisher's Response:*** *Control A was tested and worked properly. The review copy was apparently defective. The program was developed for the Apple II plus. The CAP LOCK key is only necessary for the name input.*
			3	3	3		3	3	3	
						2				
Graph Plotter **$75** (Science Research Associates, Inc., 144 North Wacker Dr., Chicago, IL 60606) 1984	Apple II family (48K)	**Grades 11-12** Demonstrates various graphical mathematical techniques such as basic graphing, transformations, and calculus topics such as secants, tangents, derivatives, points of inflection, and solving differential equations. May be used as a "dynamic blackboard" for demonstrations. Graphs may be stored for later recall.			5					**Reviewer's Comments:** This program has tremendous capabilities and great potential, but it is very complex and takes much time to learn to operate well. On-line graphing is somewhat slow, especially to use for demonstration purposes while lecturing, but screens may be prepared in advance and stored for quick recall later. Screens may also be printed, but only on an Apple Silentype printer. This program is definitely only for the upper levels of high school and college mathematics. ***Publisher's Response:*** *This program is exceedingly powerful. It not only graphs functions, derivatives, integrals, and differential equations, but also lets the user perform various transformations on these graphs.*
				4				4		
			3			3			3	
							2			

STATEWIDE MICROCOMPUTER COURSEWARE EVALUATIONS

This TECC project has identified effective mircocomputer courseware for use by Texas Educators in improving BASIC SKILLS INSTRUCTION. K-12 commercial courseware for Apple, Radio Shack and Commodore hardware systems in the subject areas of reading/language arts, mathematics, science, business education and vocational education has been evaluated.

This document provides you with a brief summary of the following evaluation data:

- Hardware System to Accommodate the Software,
- Courseware Package Name,
- Publisher,
- Subject Area,
- Grade Level, and
- Average score.

Each courseware package was evaluated by at least ten teachers throughout the State of Texas and the results were then tallied and yielded an average score. The possible scores range from a low of (1) one to a high of (5) five.

The complete evaluation data not only includes scores on the previous information but also for:

- Program cost,
- Special Hardware Requirements,
- Instructional Technique,
- Instructional Activities,
- Special Characteristics,
- Potential Uses,
- Student Instruction Time,
- Instructional Objectives,
- Presentation,
- Content, and
- Student Evaluation.

The entire evaluation data set will soon be available on-line with Bibliographic Retrieval Services (BRS), a commercial networked database system. Access to BRS requires a modem and subscription to BRS. Please contact Keith Imon at 271-7611 for further information.

Evaluation is being expanded to include identification of courseware addressing the essential elements of Computer Literacy and other general application packages appropriate to instruction and will now include software for the IBM microcomputer.

When using this document, please note that Apple Software evaluations can be found on the yellow pages, Radio Shack Software evaluations can be found on the green pages and Commodore Software evaluations can be found on the blue pages.

COURSEWARE EVALUATED 1982/83

HARDWARE	PACKAGE TITLE	PUBLISHER	SUBJECT	GRADE LEVEL	AVG.
APPLE					
	ANTONYMS-SYNONYMS	HARTLEY COURSEWARE	LANGUAGE ARTS	ELEMENTARY	4.10
			LANGUAGE ARTS	MIDDLE	3.84
	APPROXIMATION, ESTIMATION	HEINEMAN/SCOTT FORESMAN	SCIENCE	SECONDARY	4.16
	BASIC ENGLISH SKILLS	ENCYCLOPEADIA BRITANNICA	LANGUAGE ARTS	ELEMENTARY	3.31
			LANGUAGE ARTS	MIDDLE	3.43
	BECOMING AN INFORMED SHOPPER	GUIDANCE ASSOCIATES	BUSINESS	SECONDARY	3.24
	BIRTH OF THE PHOENIX	PHOENIX SOFTWARE	LANGUAGE ARTS	ELEMENTARY	2.37
			LANGUAGE ARTS	MIDDLE	2.79
			LANGUAGE ARTS	SECONDARY	3.44
	BUMBLE GAMES	THE LEARNING CO.	MATHEMATICS	ELEMENTARY	3.58
	BUMBLE PLOT	THE LEARNING CO.	MATHEMATICS	ELEMENTARY	3.61
	C.A.R.I.S.	ENCYCLOPAEDIA BRITANNICA	LANGUAGE ARTS	ELEMENTARY	3.41
	C.L.I.P.	EDUCATIONAL ACTIVITIES	BUSINESS	SECONDARY	4.55
	CAPITALIZATION	HARTLEY COURSEWARE	LANGUAGE ARTS	ELEMENTARY	3.16
			LANGUAGE ARTS	MIDDLE	2.37
	CASH VERSUS CREDIT BUYING	GUIDANCE ASSOCIATES	BUSINESS	SECONDARY	3.52
	CELLS	EDUCATIONAL ACTIVITIES	SCIENCE	ELEMENTARY	3.63
			SCIENCE	MIDDLE	3.69
	CHALLENGE MATH	SUNBURST	MATHEMATICS	ELEMENTARY	4.36
			MATHEMATICS	MIDDLE	4.17
			MATHEMATICS	SECONDARY	3.26
	CHECKERS	ODESTA	MATHEMATICS	ELEMENTARY	3.79
			MATHEMATICS	MIDDLE	3.80
			MATHEMATICS	SECONDARY	3.67
	CHESS	ODESTA	MATHEMATICS	ELEMENTARY	2.68
			MATHEMATICS	MIDDLE	3.33
			MATHEMATICS	SECONDARY	2.99
	CIRCLES	SOCIETY FOR VISUAL EDUCATION	MATHEMATICS	SECONDARY	2.56
	CLIMATE	HEINEMAN/SCOTT FORESMAN	SCIENCE	SECONDARY	4.24
	CLOCK	HARTLEY COURSEWARE	MATHEMATICS	ELEMENTARY	4.05
	CLOZE-PLUS	I/CT	LANGUAGE ARTS	SECONDARY	3.72
	CLOZE-PLUS PROGRAM	I/CT	LANGUAGE ARTS	ELEMENTARY	3.80
			LANGUAGE ARTS	MIDDLE	3.69
	COLLEGE ENTRANCE EXAM PART I	BORG-WARNER	LANGUAGE ARTS	SECONDARY	4.37
	COLLEGE ENTRANCE EXAM PART II	BORG-WARNER	LANGUAGE ARTS	SECONDARY	4.70
			MATHEMATICS	SECONDARY	4.60
	COMPARATIVE BUYING SERIES	GUIDANCE ASSOCIATES	BUSINESS	SECONDARY	3.41

HARDWARE	PACKAGE TITLE	PUBLISHER	SUBJECT	GRADE LEVEL	AVG.
APPLE Cont'd	COMPREHENSION POWER PROGRAM	I/CT	LANGUAGE ARTS	SECONDARY	3.61
	COMPREHENSION POWER, LEVEL E	I/CT	LANGUAGE ARTS	ELEMENTARY	3.58
	CONTEXT CLUES	NTS	LANGUAGE ARTS	ELEMENTARY	3.21
			LANGUAGE ARTS	MIDDLE	3.03
			LANGUAGE ARTS	SECONDARY	3.14
	COUNTING BEE	EDU-WARE	MATHEMATICS	ELEMENTARY	4.22
	CRITICAL READING A-H	BORG-WARNER	LANGUAGE ARTS	MIDDLE	3.52
	DECIMALS	CONTROL DATA/PLATO	MATHEMATICS	ELEMENTARY	4.20
	DRAGON GAMES SERIES FOR L/ ARTS	EDUCATIONAL ACTIVITIES	LANGUAGE ARTS	ELEMENTARY	3.52
	DRAWING CONCLUSIONS	NTS	LANGUAGE ARTS	ELEMENTARY	3.45
			LANGUAGE ARTS	MIDDLE	3.08
			LANGUAGE ARTS	SECONDARY	2.95
	EDU-WARE DECIMALS	EDU-WARE	MATHEMATICS	ELEMENTARY	3.61
			MATHEMATICS	MIDDLE	3.75
	EDU-WARE FRACTIONS	EDU-WARE	MATHEMATICS	ELEMENTARY	3.13
			MATHEMATICS	MIDDLE	4.55
	EDUFUN: ALIENCOUNTER & FACE FLASH	MILLIKEN	MATHEMATICS	ELEMENTARY	3.78
	EDUFUN: BATTLING BUGS	MILLIKEN	MATHEMATICS	ELEMENTARY	4.03
			MATHEMATICS	MIDDLE	4.06
			MATHEMATICS	SECONDARY	3.80
	EDUFUN: FRENZY & FLIP FLOP	MILLIKEN	MATHEMATICS	ELEMENTARY	3.59
			MATHEMATICS	MIDDLE	3.01
	EDUFUN: GOLF CLASSIC & COMPUBAR	MILLIKEN	MATHEMATICS	ELEMENTARY	4.04
			MATHEMATICS	MIDDLE	3.96
			MATHEMATICS	SECONDARY	3.88
	EDUFUN: GULP! & ARROW GRAPHICS	MILLIKEN	MATHEMATICS	ELEMENTARY	4.21
			MATHEMATICS	MIDDLE	3.10
	EDUFUN: THE JAR GAME & CHAOS	MILLIKEN	MATHEMATICS	MIDDLE	2.53
			MATHEMATICS	ELEMENTARY	2.45
	ELECTRICITY MAGNETISM	J & S SOFTWARE	SCIENCE	MIDDLE	3.69
			SCIENCE	SECONDARY	3.21
	ELECTRON STRUCTURE	J & S SOFTWARE	SCIENCE	SECONDARY	3.68
	ERNIE'S QUIZ	APPLE COMPUTER	LANGUAGE ARTS	ELEMENTARY	3.06
			MATHEMATICS	ELEMENTARY	2.94
	EXPLORER METROS	SUNBURST	MATHEMATICS	ELEMENTARY	4.20
			MATHEMATICS	MIDDLE	4.50
			MATHEMATICS	SECONDARY	4.24

HARDWARE	PACKAGE TITLE	PUBLISHER	SUBJECT	GRADE LEVEL	AVG.
APPLE Cont'd	FACT OR OPINION	NTS	LANGUAGE ARTS	SECONDARY	4.58
			LANGUAGE ARTS	ELEMENTARY	3.88
			LANGUAGE ARTS	MIDDLE	4.66
	FACT SHEETS	HARTLEY COURSEWARE	MATHEMATICS	ELEMENTARY	3.88
	FACTORING WHOLE NUMBERS	QUALITY EDUCATIONAL DESIGNS	MATHEMATICS	ELEMENTARY	3.59
			MATHEMATICS	MIDDLE	3.97
	FOLLOWING DIRECTIONS	LEARNING WELL	LANGUAGE ARTS	SECONDARY	2.75
			LANGUAGE ARTS	ELEMENTARY	2.24
			LANGUAGE ARTS	MIDDLE	2.57
	FRACTIONS	CONTROL DATA/PLATO	MATHEMATICS	ELEMENTARY	4.23
	GENETICS TRANSPORT	J & S SOFTWARE	SCIENCE	SECONDARY	3.39
	GEOMETRIC CONCEPTS	BORG-WARNER	MATHEMATICS	MIDDLE	3.82
	GERTRUDE'S PUZZLES	THE LEARNING CO.	MATHEMATICS	ELEMENTARY	1.78
	GERTRUDE'S SECRETS	THE LEARNING CO.	MATHEMATICS	ELEMENTARY	2.55
	GETTING THE MAIN IDEA	LEARNING WELL	LANGUAGE ARTS	ELEMENTARY	2.72
			LANGUAGE ARTS	MIDDLE	2.30
			LANGUAGE ARTS	SECONDARY	2.27
	GRAMMAR PROBLEMS	MILLIKEN	LANGUAGE ARTS	MIDDLE	4.28
			LANGUAGE ARTS	SECONDARY	3.98
			LANGUAGE ARTS	ELEMENTARY	4.34
	GRAPHING ON THE COORDINATE PLANE	EDUCATIONAL ACTIVITIES	MATHEMATICS	MIDDLE	3.71
			MATHEMATICS	SECONDARY	3.76
	GUINESS WORLD RECORDS	SOCIETY FOR VISUAL EDUCATION	MATHEMATICS	ELEMENTARY	4.41
			MATHEMATICS	MIDDLE	4.46
	HOME SAFE HOME	GUIDANCE ASSOCIATES	VOCATIONAL	SECONDARY	3.70
	INCOME MEETS EXPENSES	GUIDANCE ASSOCIATES	BUSINESS	SECONDARY	3.75
	INSTANT ZOO	APPLE COMPUTER	LANGUAGE ARTS	ELEMENTARY	4.11
	JOB READINESS: ASSMT. & DEV.	GUIDANCE ASSOCIATES	VOCATIONAL	SECONDARY	3.58
	JUGGLES' RAINBOW	THE LEARNING CO.	MATHEMATICS	ELEMENTARY	1.81
	LANGUAGE ARTS SEQUENCES	MILLIKEN	LANGUAGE ARTS	ELEMENTARY	3.42
			LANGUAGE ARTS	MIDDLE	3.45
			LANGUAGE ARTS	SECONDARY	2.92
	LETTER RECOGNITION	HARTLEY COURSEWARE	LANGUAGE ARTS	ELEMENTARY	3.88
	LONG DIVISION	EDUCATIONAL ACTIVITIES	MATHEMATICS	MIDDLE	3.75
			MATHEMATICS	SECONDARY	3.71
	LONGITUDINAL WAVES	HEINEMAN/SCOTT FORESMAN	SCIENCE	SECONDARY	3.75
	MAGIC MAILER	ARTSCI	BUSINESS	SECONDARY	3.57
	MAGIC WINDOW II	ARTSCI	BUSINESS	SECONDARY	3.66

HARDWARE	PACKAGE TITLE	PUBLISHER	SUBJECT	GRADE LEVEL	AVG.
APPLE Cont'd	MAGIC WORDS	ARTSCI	BUSINESS	SECONDARY	3.90
	MASTER TYPE	NTS	VOCATIONAL	SECONDARY	3.95
	MASTERING THE PARTS OF SPEECH	SOCIETY FOR VISUAL EDUCATION	LANGUAGE ARTS	SECONDARY	4.58
			LANGUAGE ARTS	ELEMENTARY	4.68
	MATH BASEBALL	EDUCATIONAL ACTIVITIES	LANGUAGE ARTS	MIDDLE	4.56
			MATHEMATICS	ELEMENTARY	4.57
			MATHEMATICS	MIDDLE	4.40
	MATH FOR EVERYDAY LIVING	EDUCATIONAL ACTIVITIES	MATHEMATICS	SECONDARY	4.13
			MATHEMATICS	ELEMENTARY	4.21
			MATHEMATICS	MIDDLE	4.52
	MATH INVADERS	EDUCATIONAL ACTIVITIES	MATHEMATICS	SECONDARY	4.33
			MATHEMATICS	MIDDLE	4.27
	MATH SKILLS-ELEMENTARY LEVEL	ENCYCLOPEDIA BRITANNICA	MATHEMATICS	SECONDARY	3.93
	MATH SKILLS- JR. HIGH LEVEL	ENCYCLOPEDIA BRITANNICA	MATHEMATICS	ELEMENTARY	3.75
	MATRIX PROBLEMS	SOCIETY FOR VISUAL EDUCATION	MATHEMATICS	MIDDLE	3.55
	MICRO READ-LEVEL 1	AMERICAN EDUCATIONAL COMPUTER	MATHEMATICS	SECONDARY	3.98
			LANGUAGE ARTS	ELEMENTARY	3.20
	MICRO READ-LEVEL 2	AMERICAN EDUCATIONAL COMPUTER	LANGUAGE ARTS	MIDDLE	2.80
			LANGUAGE ARTS	ELEMENTARY	3.12
	MICRO READ-LEVEL 3	AMERICAN EDUCATIONAL COMPUTER	LANGUAGE ARTS	MIDDLE	3.15
			LANGUAGE ARTS	ELEMENTARY	3.27
	MICRO READ-LEVEL 4	AMERICAN EDUCATIONAL COMPUTER	LANGUAGE ARTS	MIDDLE	2.88
			LANGUAGE ARTS	ELEMENTARY	3.54
	MICRO READ-LEVEL 5	AMERICAN EDUCATIONAL COMPUTER	LANGUAGE ARTS	MIDDLE	3.27
			LANGUAGE ARTS	ELEMENTARY	3.78
	MICRO READ-LEVEL 6	AMERICAN EDUCATIONAL COMPUTER	LANGUAGE ARTS	MIDDLE	3.56
			LANGUAGE ARTS	ELEMENTARY	3.43
	MICRO READ-LEVEL 7	AMERICAN EDUCATIONAL COMPUTER	LANGUAGE ARTS	MIDDLE	3.23
			LANGUAGE ARTS	SECONDARY	3.28
	MICRO READ-LEVEL 8	AMERICAN EDUCATIONAL COMPUTER	LANGUAGE ARTS	MIDDLE	3.33
			LANGUAGE ARTS	MIDDLE	3.02
	MICROCOMPUTER AS A TEACHING TOOL	SOCIETY FOR VISUAL EDUCATION	LANGUAGE ARTS	SECONDARY	3.01
			LANGUAGE ARTS	SECONDARY	3.90
			SCIENCE	ELEMENTARY	3.73
			SCIENCE	MIDDLE	3.39
			SCIENCE	SECONDARY	3.56
			LANGUAGE ARTS	ELEMENTARY	3.90
	MICROCOURSE SERIES-L/A-LEVEL 3	HOUGHTON-MIFFLIN	LANGUAGE ARTS	MIDDLE	3.74
			LANGUAGE ARTS	ELEMENTARY	2.72
			LANGUAGE ARTS	MIDDLE	2.08

HARDWARE	PACKAGE TITLE	PUBLISHER	SUBJECT	GRADE LEVEL	AVG.
APPLE Cont'd	MICROCOURSE SERIES-L/A-LEVEL 4	HOUGHTON-MIFFLIN	LANGUAGE ARTS	MIDDLE	1.65
			LANGUAGE ARTS	ELEMENTARY	2.68
	MICROCOURSE SERIES-L/A-LEVEL 5	HOUGHTON-MIFFLIN	LANGUAGE ARTS	ELEMENTARY	3.32
			LANGUAGE ARTS	MIDDLE	1.91
	MICROCOURSE SERIES-L/A-LEVEL 6	HOUGHTON-MIFFLIN	LANGUAGE ARTS	MIDDLE	1.60
			LANGUAGE ARTS	ELEMENTARY	2.90
	MICROCOURSE SERIES-L/A-LEVEL 7	HOUGHTON-MIFFLIN	LANGUAGE ARTS	ELEMENTARY	3.00
			LANGUAGE ARTS	MIDDLE	2.13
	MICROCOURSE SERIES-L/A-LEVEL 8	HOUGHTON-MIFFLIN	LANGUAGE ARTS	ELEMENTARY	2.28
			LANGUAGE ARTS	MIDDLE	2.43
	MICROCOURSE SERIES-READ-LEVEL 3	HOUGHTON-MIFFLIN	LANGUAGE ARTS	ELEMENTARY	2.49
			LANGUAGE ARTS	MIDDLE	1.92
	MICROCOURSE SERIES-READ-LEVEL 4	HOUGHTON-MIFFLIN	LANGUAGE ARTS	ELEMENTARY	4.13
	MICROCOURSE SERIES-READ-LEVEL 5	HOUGHTON-MIFFLIN	LANGUAGE ARTS	ELEMENTARY	2.85
			LANGUAGE ARTS	MIDDLE	1.88
	MICROCOURSE SERIES-READ-LEVEL 6	HOUGHTON-MIFFLIN	LANGUAGE ARTS	ELEMENTARY	2.78
			LANGUAGE ARTS	MIDDLE	2.30
	MICROCOURSE SERIES-READ-LEVEL 7	HOUGHTON-MIFFLIN	LANGUAGE ARTS	ELEMENTARY	3.09
			LANGUAGE ARTS	MIDDLE	2.20
	MICROCOURSE SERIES-READ-LEVEL 8	HOUGHTON-MIFFLIN	LANGUAGE ARTS	ELEMENTARY	3.43
			LANGUAGE ARTS	MIDDLE	2.03
	MIX AND MATCH	APPLE COMPUTER	LANGUAGE ARTS	ELEMENTARY	3.99
			LANGUAGE ARTS	MIDDLE	3.79
			LANGUAGE ARTS	SECONDARY	3.49
	MOMENTUM-WORK AND ENERGY	J & S SOFTWARE	SCIENCE	SECONDARY	3.46
	MONEY MANAGEMENT ASSMT. SERIES	GUIDANCE ASSOCIATES	BUSINESS	SECONDARY	4.27
	MONEY MNGMT: BASIC MATH SKILL	GUIDANCE ASSOCIATES	MATHEMATICS	SECONDARY	3.25
	MONEY! MONEY!	HARTLEY COURSEWARE	MATHEMATICS	ELEMENTARY	3.46
	MULTIPLE CHOICE FILES	COMPU-TATIONS	VOCATIONAL	SECONDARY	4.13
			BUSINESS	SECONDARY	4.04
	ODIN	ODESTA	MATHEMATICS	ELEMENTARY	3.69
			MATHEMATICS	MIDDLE	3.79
			MATHEMATICS	SECONDARY	4.01
	OPPOSITES	HARTLEY COURSEWARE	LANGUAGE ARTS	ELEMENTARY	3.63
			LANGUAGE ARTS	MIDDLE	3.93
			LANGUAGE ARTS	SECONDARY	5.00
	OXIDATION REDUCTION	J & S SOFTWARE	SCIENCE	SECONDARY	3.30
	PAL READING CURRICULUM 2-6	UNIVERSAL SYSTEMS FOR EDUC.	LANGUAGE ARTS	ELEMENTARY	2.09
	PARTS OF THE MICROSCOPE	EDUCATIONAL ACTIVITIES	SCIENCE	MIDDLE	2.92

COURSEWARE EVALUATED 1982/83

HARDWARE	PACKAGE TITLE	PUBLISHER	SUBJECT	GRADE LEVEL	AVG.
APPLE Cont'd	PERCENTAGES	EDUCATIONAL ACTIVITIES	MATHEMATICS	MIDDLE	3.37
			MATHEMATICS	SECONDARY	3.24
	PERIODIC TABLE	J & S SOFTWARE	SCIENCE	SECONDARY	3.19
	PHRASE READING I	CREATIVE CURRICULUM	LANGUAGE ARTS	MIDDLE	2.41
			LANGUAGE ARTS	SECONDARY	2.33
	PHRASE READING II	CREATIVE CURRICULUM	LANGUAGE ARTS	MIDDLE	2.40
			LANGUAGE ARTS	SECONDARY	2.26
	PHYSICS: ELEMENTARY MECHANICS	CONTROL DATA/PLATO	SCIENCE	SECONDARY	4.70
	PHYSIOLOGICAL SIMULATION	HEINEMAN/SCOTT FORESMAN	SCIENCE	SECONDARY	3.83
	POISON PROOF YOUR HOME	GUIDANCE ASSOCIATES	VOCATIONAL	SECONDARY	3.63
	PRE-ALGEBRA PART 2	SOCIETY FOR VISUAL EDUCATION	MATHEMATICS	MIDDLE	2.40
			MATHEMATICS	SECONDARY	2.77
	PROBLEM SOLVING IN EVERYDAY MATH	GUIDANCE ASSOCIATES	MATHEMATICS	SECONDARY	4.03
	READ/COMP: BERMUDA TRIANGLE	ENCYCLOPAEDIA BRITANNICA	LANGUAGE ARTS	ELEMENTARY	3.60
			LANGUAGE ARTS	MIDDLE	3.80
			LANGUAGE ARTS	SECONDARY	3.76
	READ/COMP: IRON HORSE	ENCYCLOPAEDIA BRITANNICA	LANGUAGE ARTS	ELEMENTARY	3.61
			LANGUAGE ARTS	MIDDLE	3.76
	READING COMPREHENSION POWER	MILLIKEN	LANGUAGE ARTS	ELEMENTARY	4.11
			LANGUAGE ARTS	MIDDLE	4.46
			LANGUAGE ARTS	SECONDARY	4.43
	READING FOR DETAIL	LEARNING WELL	LANGUAGE ARTS	ELEMENTARY	3.02
			LANGUAGE ARTS	MIDDLE	3.43
			LANGUAGE ARTS	SECONDARY	2.21
	RENDEZVOUS	EDU-WARE	SCIENCE	MIDDLE	3.44
			SCIENCE	SECONDARY	4.20
	RHYMES AND RIDDLES	SPINNAKER SOFTWARE CORP.	LANGUAGE ARTS	ELEMENTARY	3.53
	ROCKY'S BOOTS	THE LEARNING CO.	MATHEMATICS	ELEMENTARY	2.81
	SENTENCE STRUCTURE A-D	BORG-WARNER	LANGUAGE ARTS	MIDDLE	3.80
	SEQUENCE	LEARNING WELL	LANGUAGE ARTS	ELEMENTARY	3.98
			LANGUAGE ARTS	MIDDLE	3.82
			LANGUAGE ARTS	SECONDARY	3.97
	SOCCER MATH	COMPU-TATIONS	MATHEMATICS	ELEMENTARY	3.81
			MATHEMATICS	MIDDLE	3.03
	SOLVING ADDITION & MULT. PROBLEMS	GUIDANCE ASSOCIATES	MATHEMATICS	SECONDARY	4.26
	SOLVING EQUATIONS-LEVELS I-III	EDUCATIONAL ACTIVITIES	MATHEMATICS	SECONDARY	4.11
			MATHEMATICS	MIDDLE	3.69
	SOLVING MULTIPLE STEP PROBLEMS	GUIDANCE ASSOCIATES	MATHEMATICS	SECONDARY	3.37
	SOLVING SUBTRACT. & DIV. PROBLEMS	GUIDANCE ASSOCIATES	MATHEMATICS	SECONDARY	3.41

HARDWARE	PACKAGE TITLE	PUBLISHER	SUBJECT	GRADE LEVEL	AVG.
APPLE Cont'd	SPEED READING COURSEWARE	CREATIVE CURRICULUM	LANGUAGE ARTS	MIDDLE	2.63
			LANGUAGE ARTS	SECONDARY	2.86
	SPELLING BEE GAMES	EDU-WARE	LANGUAGE ARTS	ELEMENTARY	3.30
	SPELLING WIZ	DLM	LANGUAGE ARTS	ELEMENTARY	3.95
	SPOTLIGHT	APPLE COMPUTER	LANGUAGE ARTS	ELEMENTARY	3.55
			LANGUAGE ARTS	MIDDLE	3.55
			MATHEMATICS	ELEMENTARY	3.50
			MATHEMATICS	MIDDLE	4.13
	STARTING OUT, SET 1	NTS	MATHEMATICS	ELEMENTARY	3.28
	STORY MACHINE	SPINNAKER SOFTWARE CORP.	LANGUAGE ARTS	ELEMENTARY	3.28
	STUDY QUIZ FILES	COMPU-TATIONS	BUSINESS	SECONDARY	3.84
			VOCATIONAL	SECONDARY	3.94
	SURVIVAL MATH	SUNBURST	MATHEMATICS	MIDDLE	2.98
			MATHEMATICS	SECONDARY	2.82
	TEASERS BY TOBBS	SUNBURST	MATHEMATICS	SECONDARY	2.87
			MATHEMATICS	ELEMENTARY	3.92
			MATHEMATICS	MIDDLE	4.06
	TRANSVERSE WAVES	HEINEMAN/SCOTT FORESMAN	SCIENCE	SECONDARY	3.46
	UNDERSTANDING SALES BUYING	GUIDANCE ASSOCIATES	BUSINESS	SECONDARY	3.32
	USING A CALENDAR	HARTLEY COURSEWARE	MATHEMATICS	ELEMENTARY	2.20
	VERB USAGE 1, 2 & 3	HARTLEY COURSEWARE	LANGUAGE ARTS	ELEMENTARY	3.07
	VERB VIPER	DLM	LANGUAGE ARTS	ELEMENTARY	3.55
	VERBS	HARTLEY COURSEWARE	LANGUAGE ARTS	ELEMENTARY	3.94
			LANGUAGE ARTS	MIDDLE	4.09
	VOCABULARY BASEBALL	J & S SOFTWARE	LANGUAGE ARTS	SECONDARY	3.49
	WATCH YOUR LANGUAGE	NTS	LANGUAGE ARTS	SECONDARY	1.98
			LANGUAGE ARTS	MIDDLE	1.77
	WEATHER FRONTS	TEACH YOURSELF COMP. SOFTWARE	SCIENCE	SECONDARY	3.56
	WHO-WHAT-WHERE-WHEN-WHY	HARTLEY COURSEWARE	LANGUAGE ARTS	ELEMENTARY	3.96
	WHOLE BRAIN SPELLING	SUBLOGIC CORP.	LANGUAGE ARTS	ELEMENTARY	3.62
			LANGUAGE ARTS	MIDDLE	3.08
			LANGUAGE ARTS	SECONDARY	3.10
	WHOLE NUMBERS	CONTROL DATA/PLATO	MATHEMATICS	ELEMENTARY	3.86
			MATHEMATICS	MIDDLE	4.14
	WORD DEMON	IDEATECH	LANGUAGE ARTS	ELEMENTARY	1.91
			LANGUAGE ARTS	MIDDLE	1.89
			LANGUAGE ARTS	SECONDARY	1.85
	WORD FAMILIES	HARTLEY COURSEWARE	LANGUAGE ARTS	ELEMENTARY	2.47
	WORD INVASION	DLM	LANGUAGE ARTS	ELEMENTARY	4.27
	WORD MAN	DLM	LANGUAGE ARTS	ELEMENTARY	3.56

HARDWARE	PACKAGE TITLE	PUBLISHER	SUBJECT	GRADE LEVEL	AVG.
APPLE Cont'd	WORD MASTER	DLM	LANGUAGE ARTS	ELEMENTARY	3.95
	WORD MEMORY PROGRAM	I/CT	LANGUAGE ARTS	ELEMENTARY	1.61
	WORD RADAR	DLM	LANGUAGE ARTS	ELEMENTARY	3.76
	WORD STRUCTURE A-H	BORG-WARNER	LANGUAGE ARTS	MIDDLE	4.53
	WORDS ARE FUN, SET I	NTS	LANGUAGE ARTS	ELEMENTARY	3.07
	WORDSEARCH	HARTLEY COURSEWARE	LANGUAGE ARTS	ELEMENTARY	3.83
			LANGUAGE ARTS	MIDDLE	3.87
			LANGUAGE ARTS	SECONDARY	3.13
	WORDSKILL, LEVEL 1	SCIENCE RESEARCH ASSOCIATES	LANGUAGE ARTS	MIDDLE	3.93
	WORDSKILL, LEVEL 2	SCIENCE RESEARCH ASSOCIATES	LANGUAGE ARTS	MIDDLE	3.25
	WORDSKILL, LEVEL 3	SCIENCE RESEARCH ASSOCIATES	LANGUAGE ARTS	MIDDLE	3.54
			LANGUAGE ARTS	SECONDARY	3.30
	WORDSKILL, LEVEL 4	SCIENCE RESEARCH ASSOCIATES	LANGUAGE ARTS	SECONDARY	4.10
	WORDSKILL, LEVEL 5	SCIENCE RESEARCH ASSOCIATES	LANGUAGE ARTS	SECONDARY	4.08
	WORDSKILL, LEVEL 6	SCIENCE RESEARCH ASSOCIATES	LANGUAGE ARTS	SECONDARY	4.52
	WRITING SKILLS: SENTENCE COMBININ	MILLIKEN	LANGUAGE ARTS	ELEMENTARY	3.97
			LANGUAGE ARTS	MIDDLE	4.11
			LANGUAGE ARTS	SECONDARY	3.94
	YOU CAN BANK ON IT	GUIDANCE ASSOCIATES	BUSINESS	SECONDARY	4.05
	ZOOM GRAFIX	PHOENIX SOFTWARE	MATHEMATICS	ELEMENTARY	2.00
			MATHEMATICS	MIDDLE	2.00
			MATHEMATICS	SECONDARY	2.10
	ALPINE SKIER	DATA COMMAND	READING	5-9	3.88
	BIG DOOR DEAL	DATA COMMAND	READING	4-8	3.47
	COMPREHENSION POWER	MILLIKEN	READING	4-12	2.79
	COMPU READ 3.0	EDU-WARE SERVICES	READING	3-5	2.66
	CONSONANTS/BLENDS	HARTLEY COURSEWARE IN	READING	3-5	3.05
	DIASCRIPTIVE READING	EDUCATIONAL ACTIVITI	READING	3-9	2.52
	EARLY ELEM DISK II	COMPU-TATIONS	READING	K-2	2.98
	ELEM MY DEAR APPLE	SPECIAL DELIVERY SFT	READING	3-12	4.10
	GRAMMAR PACKAGE	EDU-WARE SERVICES IN	READING	3-9	4.15
	HAPPY FACE	CROSS ED SOFTWARE	READING	2,3,4,5,6,9	3.70
	HOMONYMS	BARTLEY COURSEWARE	READING	3-9	3.96
	LANGUAGE ARTS PKG	MICRO POWER & LIGHT	READING	5-12	3.44
	MAGIC SPELLS	SPECIAL DELIVERY SFW	READING	2-12	4.26
	MOPTOWN	SPECIAL DELIVERY SFW	READING	1-10	4.33
	READ CONTENT AREAS	EDUCATIONAL ACTIVITI	READING	3-8	2.71
	READING & GRAMMAR	MILLIKEN	READING	3-9	4.25
	READING COMPRE 3 & 4	BLS SOFTWARE	READING	3-6	2.47
	READING COMPRE 5 & 6	BLS SOFTWARE	READING	5-12	2.79

HARDWARE	PACKAGE TITLE	PUBLISHER	SUBJECT	GRADE LEVEL	AVG.
APPLE Cont'd	RIDDLE? ME THIS	DATA COMMAND	READING	3-5	3.55
	ROOTS/AFFIXES	HARTLEY COURSEWARE	READING	3-8	3.40
	SPEED READER	SPECIAL DELIVERY SFW	READING	7-12	3.34
	TENNIS ANYONE?	DATA COMMAND	READING	3-9	4.23
	THE GAME SHOW	COMPUTER-ADVANC IDEA	READING	3,5,6,7,8,9,10	4.02
	VISIFILE	VISI CORP	READING	9-12	3.42
	VISIPLOT	VISI CORP	READING	9-12	3.62
	VOCABULARY DOLCH	HARTLEY COURSEWRE IN	READING	K-3	2.97
	VOWELS	HARTLEY COURSEWRE INC	READING	3-5	3.04
	WIZARDRY	SIR-TECH SOFTWR INC	READING	9-12	4.28
	MINUS MISSION	DLM	MATH	1-3	3.85
	METRIC DRILL	HARTLEY COURSEWARE	MATH	3-12	2.30
	9th & 5th GR TAB	CREATIVE PROGRAMMERS	MATH	1-9	2.78
	PERCENTAGES-REVIEW	BLS INC	MATH	7-12	4.07
	PRESCPIV MATH DRILL	HARTLEY COURSEWARE	MATH	1-3	3.37
	READ SOLV MATH PROB	EDUCATIONAL ACTIVITI	MATH	3-7	3.06
	SOCCER MATH	COMPU-TATIONS	MATH	1-12	3.85
	SOLVE WORD PROB MATH	EVE GATE MEDIA	MATH	4-9	2.62
	VECTORS & GRAPHING	CROSS ED SOFTWARE	MATH	11,12	4.01
	VISICALC	VISI CORP	MATH	3-12	3.84
	WHOLE NUMBERS	STERLING SWIFT	MATH	1-9	3.98
	ZES COURSEWARE STATS	AVANT-GARDE CREATION	MATH	7-10	2.97
	ZES: QUADRIC PARABOL	AVANT-GARDE CREATION	MATH	11,12	3.20
	ALGEBRA 1	EDU-WARE	MATH	8-12	3.27
	ALIEN ADDITION	DLM	MATH	1-3	4.09
	ALLIGATOR MIX	DLM	MATH	1-3	4.05
	ARITHMETIC CLSRM MULT	STERLING SWIFT	MATH	3-9	4.09
	ARITHMETIC CLSRM ADD	STERLING SWIFT	MATH	1-9	3.67
	ARITHMETIC CLSRM SUB	STERLING SWIFT	MATH	1-9	4.26
	ARITHMETIC CLSRM DIV	STERLING SWIFT	MATH	3-9	4.79
	ARITHMETIC GAMES	SRA	MATH	3-12	3.48
	BASIC MATH COMP SKILL	EDUCATIONAL ACTIVITI	MATH	1-12	3.43
	COMP DRL INST MATH B	SRA	MATH	2-7	4.26
	COMP MATH LEVEL C	SRA	MATH	1-9	3.61
	COMPL DRL & INSTRCTN	FACT TRACK	MATH	K-9	4.14
	COMPU MATH SERIES	EDU-WARE SERVICES	MATH	1-9	2.39
	COMPUTERIZED MATH - 3	EDU-DISK	MATH	3-5	3.39
	COMPUTERIZED MATH - 5	EDU-DISK	MATH	4-9	5.00
	DECIMALS-A REVIEW	BLS INC	MATH	5-12	2.99
	DEMOLITION DIVISION	DLM	MATH	4-6	4.02

COURSEWARE EVALUATED 1982/83

HARDWARE	PACKAGE TITLE	PUBLISHER	SUBJECT	GRADE LEVEL	AVG.
APPLE Cont'd	DRAGON MIX	DLM	MATH	3-6	2.80
	ELEMENTARY MATH	MUSE CO	MATH	K-5	3.25
	ELEM MY DEAR APPLE	SPECIAL DELIVERY SFT	MATH	3-12	4.30
	EXPANDED NOTATION	HARTLEY COURSEWARE	MATH	4-9	3.90
	FACT TRACKS	SRA	MATH	1-5	3.03
	FRACTIONS & DECIMALS	STERLING SWIFT	MATH	5-12	4.32
	FRACTIONS A REVIEW	BLS	MATH	5-9	3.62
	GEOMETRY MEASRMT 1 & 2	SPECIAL DELIVERY SFW	MATH	1-11	3.80
	MATH & LOGIC PKG	MICRO POWER & LIGHT	MATH	5-12	3.75
	MATH CONCEPTS	HARTLEY COURSEWARE	MATH	2-5	3.41
	MATH SEQUENCES 1-8	MILLIKEN	MATH	1-9	3.30
	MATH STRATEGY	APPLE COMPUTER INC	MATH	K-12	3.76
	MATH TABS 3 & 5	REGION XIX ED SERVICE	MATH	1-9	3.28
	MATHER BASIC/SYSTM 5	MATHWARE	MATH	K-12	2.78
	METEOR MULTIPLICATIO	DLM	MATH	2-5	4.27

HARDWARE	PACKAGE TITLE	PUBLISHER	SUBJECT	GRADE LEVEL	AVG.
PET	BRIDGE TO TERABITHIA	SUNBURST	LANGUAGE ARTS	ELEMENTARY	3.16
			LANGUAGE ARTS	MIDDLE	3.40
			SCIENCE	MIDDLE	3.70
			SCIENCE	SECONDARY	2.44
			LANGUAGE ARTS	ELEMENTARY	2.60
			MATHEMATICS	MIDDLE	4.13
			MATHEMATICS	SECONDARY	3.96
	FIFTH & NINTH TABS TEST	LONE STAR EDUC. SOFTWARE	MATHEMATICS	ELEMENTARY	3.85
			MATHEMATICS	MIDDLE	3.03
	FUNDAMENTALS OF MATH	STERLING SWIFT PUBLISHING	MATHEMATICS	ELEMENTARY	4.35
			MATHEMATICS	MIDDLE	2.92
			MATHEMATICS	SECONDARY	2.99
			MATHEMATICS	SECONDARY	3.75
			MATHEMATICS	MIDDLE	3.15
			MATHEMATICS	SECONDARY	3.84
			MATHEMATICS	MIDDLE	4.05
			MATHEMATICS	ELEMENTARY	3.73
			MATHEMATICS	MIDDLE	4.33
			MATHEMATICS	SECONDARY	4.05
			MATHEMATICS	MIDDLE	3.18
			MATHEMATICS	SECONDARY	3.43
	MR. READWELL	MICROGRAMS	LANGAUGE ARTS	ELEMENTARY	3.05
			SCIENCE	MIDDLE	4.21
			MATHEMATICS	MIDDLE	4.24
			MATHEMATICS	SECONDARY	4.10
	PROFESSOR SNEAD	MICROGRAMS	LANGUAGE ARTS	MIDDLE	3.13
	SEQUENCING SAM	MICROGRAMS	LANGUAGE ARTS	ELEMENTARY	3.32
	SPELLING WORDS	LONE STAR EDUC. SOFTWARE	LANGUAGE ARTS	ELEMENTARY	2.77
	WINDOWS TO READING, GROUP 1	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	3.88
	WINDOWS TO READING, GROUP 10	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	3.44
	WINDOWS TO READING, GROUP 11	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	3.64
	WINDOWS TO READING, GROUP 12	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	3.52
	WINDOWS TO READING, GROUP 13	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	3.43
	WINDOWS TO READING, GROUP 14	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	3.43
	WINDOWS TO READING, GROUP 15	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	3.69
	WINDOWS TO READING, GROUP 16	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	3.57
	WINDOWS TO READING, GROUP 17	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	3.60
	WINDOWS TO READING, GROUP 18	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	3.43
	WINDOWS TO READING, GROUP 19	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	3.24
	WINDOWS TO READING, GROUP 2	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	3.81

HARDWARE	PACKAGE TITLE	PUBLISHER	SUBJECT	GRADE LEVEL	AVG.
PET Cont'd	WINDOWS TO READING, GROUP 20	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	3.34
	WINDOWS TO READING, GROUP 21	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	3.26
	WINDOWS TO READING, GROUP 22	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	3.63
	WINDOWS TO READING, GROUP 23	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	3.49
	WINDOWS TO READING, GROUP 24	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	3.42
	WINDOWS TO READING, GROUP 25	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	3.35
	WINDOWS TO READING, GROUP 26	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	3.47
	WINDOWS TO READING, GROUP 27	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	3.23
	WINDOWS TO READING, GROUP 28	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	3.47
	WINDOWS TO READING, GROUP 29	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	3.53
	WINDOWS TO READING, GROUP 3	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	3.38
	WINDOWS TO READING, GROUP 30	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	3.48
	WINDOWS TO READING, GROUP 31	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	3.23
	WINDOWS TO READING, GROUP 32	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	3.29
	WINDOWS TO READING, GROUP 33	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	3.53
	WINDOWS TO READING, GROUP 34	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	3.19
	WINDOWS TO READING, GROUP 35	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	3.27
	WINDOWS TO READING, GROUP 36	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	3.17
	WINDOWS TO READING, GROUP 37	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	3.09
	WINDOWS TO READING, GROUP 38	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	3.33
	WINDOWS TO READING, GROUP 39	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	2.87
	WINDOWS TO READING, GROUP 4	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	3.72
	WINDOWS TO READING, GROUP 40	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	2.95
	WINDOWS TO READING, GROUP 5	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	3.59
	WINDOWS TO READING, GROUP 6	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	3.60
	WINDOWS TO READING, GROUP 7	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	2.48
	WINDOWS TO READING, GROUP 8	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	3.44
	WINDOWS TO READING, GROUP 9	MICRO-ED	LANGUAGE ARTS	ELEMENTARY	3.25
	DIASCRIPTIVE READING	EDUCATIONAL ACTIVITI	READING	3-9	2.98
	DIRECTION & DISTANCE	SCHOLASTIC BOOK SERV	READING	1-3	2.81
	EXTRA SPELLING PRACT	MICRO-ED	READING	3	3.80
	JR & SR HI SPELLING	MICROPHYS PROGRAMS	READING	7-12	3.00
	JR HIGH VOCABULARY	MICROPHYS PROGRAMS	READING	7-12	3.80
	MAP DIRECTIONS 2	SCHOLASTIC BOOK SERV	READING	2-6	3.54
	MAP DIRECTIONS 1	SCHOLASTIC BOOK SERV	READING	2-5	2.61
	MINDSTRETCHER SERIES	ISLAND SOFTWARE	READING	3-12	3.10
	NUMBER WORDS	SCHOLASTIC BOOK SERV	READING	1-12	3.11
	PUNCTUATION	MICRO-ED	READING	4-6	3.65
	READ CONTENT SCIENCE	EDUCATIONAL ACTIVITI	READING	3,5,6,9	2.59
	READ SCIENCE SOC STU	EDUCATIONAL ACTIVITI	READING	3-7	2.88
	READ IN CONTENT LIT	EDUCATIONAL ACTIVITI	READING	5,6	3.27
	READ IN CONTENT MATH	EDUCATIONAL ACTIVITI	READING	5-8	2.69

HARDWARE	PACKAGE TITLE	PUBLISHER	SUBJECT	GRADE LEVEL	AVG.
PET Cont'd	SR HIGH VOCABULARY	MICROPHYS PROGRAMS	READING	10-12	3.82
	WEIRD & WACKY WORLD #2	EDUCATIONAL ACTIVITI	READING	4-7	3.66
	WORD CONTEXT SPELLIN	MICRO-ED	READING	2	3.62
	ADD FACTS 0 - 10	SCHOLASTIC BOOK SERV	MATH	1	3.55
	ADD FACTS 0 - 25	SCHOLASTIC BOOK SERV	MATH	K-3	3.48
	ADD FACTS 0 - 5	SCHOLASTIC BOOK SERV	MATH	K-2	2.88
	ADDITION TABLE	SCHOLASTIC BOOK SERV	MATH	1-3	3.21
	BARGRAPH	SCHOLASTIC BOOK SERV	MATH	3-5	2.10
	CLOCK	SCHOLASTIC BOOK SERV	MATH	K-3	4.26
	COLUMN ADD	SCHOLASTIC BOOK SERV	MATH	1-12	3.87
	COMPARE FRACTIONS	SCHOLASTIC BOOK SERV	MATH	4-10	3.87
	COUNTING 1	SCHOLASTIC BOOK SERV	MATH	K-2	3.88
	DIVISION FACTS 0 - 25	SCHOLASTIC BOOK SERV	MATH	3-9	3.03
	DIVISION FACTS 0 - 81	SCHOLASTIC BOOK SERV	MATH	3-9	3.42
	DRAGSTRIP MATH	SCHOLASTIC BOOK SERV	MATH	K-12	3.68
	FACTORS	SCHOLASTIC BOOK SERV	MATH	5-12	3.38
	FAST ADD	SCHOLASTIC BOOK SERV	MATH	1-9	3.47
	FRACTION-EQUIV 1	SCHOLASTIC BOOK SERV	MATH	4-9	3.47
	FRACTIONS 1	SCHOLASTIC BOOK SERV	MATH	2,3	3.40
	FRACTIONS 2	SCHOLASTIC BOOK SERV	MATH	1-5	3.33
	GENIE	SCHOLASTIC BOOK SERV	MATH	2-12	3.99
	HEXOMINOS	SCHOLASTIC BOOK SERV	MATH	6-12	2.51
	INEQUALITIES	SCHOLASTIC BOOK SERV	MATH	2-9	3.90
	MAP DIRECTIONS ONE	SCHOLASTIC BOOK SERV	MATH	2-5	2.93
	MAP DIRECTIONS TWO	SCHOLASTIC BOOK SERV	MATH	3-6	2.12
	MATH DRILL	SCHOLASTIC BOOK SERV	MATH	2-10	3.55
	MATH SEQUENCES 1-6	MILLIKEN	MATH	K-9	3.75
	METRIC CONVERSIONS	SCIENCE KIT INC	MATH	5-12	2.93
	MICROCOMP PROG MATH	EDUCATIONAL ACTIVITI	MATH	3-12	3.19
	MULTIPLY FACTS 0-100	SCHOLASTIC BOOK SERV	MATH	3-10	3.30
	MULTIPLY FACTS 0-25	SCHOLASTIC BOOK SERV	MATH	1-6	2.96
	NUMBER SEQUENCE I	SCHOLASTIC BOOK SERV	MATH	K-2	3.97
	NUMBER SEQUENCE II	SCHOLASTIC BOOK SERV	MATH	1-3	3.33
	NUMBER WORDS	SCHOLASTIC BOOK SERV	MATH	2-12	2.80
	PLACE VALUE	SCHOLASTIC BOOK SERV	MATH	K-9	3.38
	PLACE VALUE I	SCHOLASTIC BOOK SERV	MATH	2-9	3.32
	READ & SOLVE MATH PR	EDUCATIONAL ACTIVITI	MATH	3-9	3.95
	ROUNDING	SCHOLASTIC BOOK SERV	MATH	3-7	2.77
	RULER CENTIMETERS	SCHOLASTIC BOOK SERV	MATH	1-10	3.01
	RULER INCHES	SCHOLASTIC BOOK SERV	MATH	1-3	3.45
	RULER OBJECTS CM	SCHOLASTIC BOOK SERV	MATH	3-9	2.86
	SUBTRACT FACTS 0-1	SCHOLASTIC BOOK SERV	MATH	1-3	3.30

HARDWARE	PACKAGE TITLE	PUBLISHER	SUBJECT	GRADE LEVEL	AVG.
PET Cont'd	SUBTRACT FACTS 0-20	SCHOLASTIC BOOK SERV	MATH	K-4	3.31
	SUBTRACT FACTS 0-5	SCHOLASTIC BOOK SERV	MATH	K-2	3.03
	3 & 5 GR TAB OBJEC	COMPUTER EXPERIENCE	MATH	3,5	3.68
	TIC TAC FACTS	SCHOLASTIC BOOK SERV	MATH	1-12	4.19
	VERBAL PROB GEOM VI	MICRO-PHYS	MATH	7-12	3.50
	ZAP ADD 2-6	SCHOLASTIC BOOK SERV	MATH	1-9	3.09
	ZAP ADD 5-9	SCHOLASTIC BOOK SERV	MATH	2-9	3.49
	ZAP MULTIPLY 2-6	SCHOLASTIC BOOK SERV	MATH	3-8	3.54
	ZAP MULTIPLY 5-9	SCHOLASTIC BOOK SERV	MATH		2.90

HARDWARE	PACKAGE TITLE	PUBLISHER	SUBJECT	GRADE LEVEL	AVG.
TRS-80	ACCOUNTS PAYABLE	RADIO SHACK	VOCATIONAL	SECONDARY	3.45
	ACCOUNTS RECEIVABLE	RADIO SHACK	VOCATIONAL	SECONDARY	4.10
	ADVANCED GRAPHICS	RADIO SHACK	MATHEMATICS	SECONDARY	3.61
			SCIENCE	SECONDARY	3.54
	BUGS	NTS	SCIENCE	MIDDLE	2.63
			SCIENCE	SECONDARY	3.52
	BUSINESS ANALYSIS GRAPHICS PAK	RADIO SHACK	VOCATIONAL	SECONDARY	4.00
	BUSINESS GRAPHICS ANALYSIS PAK	RADIO SHACK	SCIENCE	SECONDARY	4.00
			BUSINESS	SECONDARY	4.00
	BUSINESS MAILING LIST	RADIO SHACK	BUSINESS	SECONDARY	4.00
			VOCATIONAL	SECONDARY	3.95
	C.A.R.D. 1	RADIO SHACK	LANGUAGE ARTS	ELEMENTARY	2.92
			LANGUAGE ARTS	MIDDLE	2.27
			SCIENCE	ELEMENTARY	3.99
			SCIENCE	MIDDLE	4.17
	COMPUTER DISCOVERY - JR. HIGH	RADIO SHACK	MATHEMATICS	MIDDLE	4.50
	COMPUTER DISCOVERY - SR. HIGH	RADIO SHACK	MATHEMATICS	SECONDARY	4.15
			BUSINESS	SECONDARY	4.30
	DESKTOP/PLAN 80	RADIO SHACK	SCIENCE	SECONDARY	3.00
			BUSINESS	SECONDARY	3.00
			VOCATIONAL	SECONDARY	3.00
	DISK PAYROLL	RADIO SHACK	BUSINESS	SECONDARY	4.10
			VOCATIONAL	SECONDARY	3.60
			LANGUAGE ARTS	ELEMENTARY	4.20
	EARTH SCIENCE SERIES	TEACH YOURSELF COMP. SOFTWARE	SCIENCE	MIDDLE	3.35
	ENHANCED VISICALC	RADIO SHACK	SCIENCE	SECONDARY	2.90
			BUSINESS	SECONDARY	2.85
			VOCATIONAL	SECONDARY	2.90
	EQUATIONS	EDUCATIONAL ACTIVITIES	MATHEMATICS	MIDDLE	3.83
			MATHEMATICS	SECONDARY	3.72
	EUCLID GEOMETRY TUTOR	RADIO SHACK	MATHEMATICS	MIDDLE	2.75
			MATHEMATICS	SECONDARY	2.87
	GENERAL LEDGER	RADIO SHACK	VOCATIONAL	SECONDARY	4.50
			BUSINESS	SECONDARY	3.85
	GRAPHING	EDUCATIONAL ACTIVITIES	MATHEMATICS	MIDDLE	3.86
			MATHEMATICS	SECONDARY	3.92
	HMRS: 20,000 LEAGUES UNDER SEA	RADIO SHACK	LANGUAGE ARTS	ELEMENTARY	3.78
			LANGUAGE ARTS	MIDDLE	3.32
	HMRS: HOUND OF THE BASKERVILLES	RADIO SHACK	LANGUAGE ARTS	ELEMENTARY	3.57
			LANGUAGE ARTS	MIDDLE	3.63

COURSEWARE EVALUATED 1982/83

HARDWARE	PACKAGE TITLE	PUBLISHER	SUBJECT	GRADE LEVEL	AVG.
TRS-80 Cont'd	HMRS: MOBY DICK	RADIO SHACK	LANGUAGE ARTS	MIDDLE	3.60
	HMRS: MOBY DICK	RADIO SHACK	LANGUAGE ARTS	ELEMENTARY	3.50
	INDIVIDUAL STUDY CENTER	TEACH YOURSELF COMP. SOFTWARE	SCIENCE	SECONDARY	3.73
			LANGUAGE ARTS	ELEMENTARY	3.87
			LANGUAGE ARTS	MIDDLE	3.90
			LANGUAGE ARTS	SECONDARY	3.93
			MATHEMATICS	ELEMENTARY	3.97
			MATHEMATICS	MIDDLE	3.66
			MATHEMATICS	SECONDARY	3.88
			SCIENCE	ELEMENTARY	3.82
			SCIENCE	MIDDLE	3.85
	INVENTORY CONTROL	RADIO SHACK	BUSINESS	SECONDARY	3.44
			MATHEMATICS	MIDDLE	3.95
			MATHEMATICS	SECONDARY	3.75
	MANUFACTURING INVENTORY CONTROL	RADIO SHACK	VOCATIONAL	SECONDARY	3.18
			MATHEMATICS	ELEMENTARY	3.45
			MATHEMATICS	MIDDLE	3.25
			MATHEMATICS	SECONDARY	2.86
			MATHEMATICS	MIDDLE	4.39
			MATHEMATICS	SECONDARY	4.45
			MATHEMATICS	ELEMENTARY	4.36
			MATHEMATICS	MIDDLE	3.00
			MATHEMATICS	SECONDARY	3.00
	MATRICES, DETERMINANTS	RADIO SHACK	MATHEMATICS	SECONDARY	4.60
			SCIENCE	SECONDARY	4.60
	MOVING ON, SET 2	NTS	MATHEMATICS	MIDDLE	3.19
			MATHEMATICS	SECONDARY	3.26
	NUMBER THEORY	RADIO SHACK	MATHEMATICS	MIDDLE	3.28
			SCIENCE	MIDDLE	2.78
			SCIENCE	SECONDARY	3.08
	NUMERIC DATA ENTRY PRACTICE	RADIO SHACK	VOCATIONAL	SECONDARY	3.10
			BUSINESS	SECONDARY	2.97
			SCIENCE	MIDDLE	3.84
			MATHEMATICS	MIDDLE	3.88
			MATHEMATICS	SECONDARY	3.86
	PERSONNEL MANAGER	RADIO SHACK	BUSINESS	SECONDARY	4.05
			VOCATIONAL	SECONDARY	3.75
	PLANE ANALYTIC GEOMETRY	RADIO SHACK	MATHEMATICS	SECONDARY	3.90
			SCIENCE	SECONDARY	3.86
	PROFILE III+	RADIO SHACK	BUSINESS	SECONDARY	4.28

COURSEWARE EVALUATED 1982/83

HARDWARE	PACKAGE TITLE	PUBLISHER	SUBJECT	GRADE LEVEL	AVG.
TRS-80 Cont'd	PROJECT MANAGER	RADIO SHACK	BUSINESS	SECONDARY	3.85
			VOCATIONAL	SECONDARY	3.60
	QUADRATIC EQUATIONS	RADIO SHACK	MATHEMATICS	SECONDARY	3.93
	READING SKILLS LAB, SET B	NTS	LANGUAGE ARTS	ELEMENTARY	3.70
			LANGUAGE ARTS	MIDDLE	3.75
	READING SKILLS LAB, SET C	NTS	LANGUAGE ARTS	MIDDLE	3.46
			LANGUAGE ARTS	SECONDARY	3.63
			MATHEMATICS	ELEMENTARY	3.83
	SUPERSCRIPSIT	RADIO SHACK	BUSINESS	SECONDARY	2.30
			VOCATIONAL	SECONDARY	2.30
	SUPERSCRIPSIT-SPELLING DICTIONARY	RADIO SHACK	BUSINESS	SECONDARY	3.15
			VOCATIONAL	SECONDARY	3.15
	TEACHER'S FRIEND (ESL)	SOFT SPOT	LANGUAGE ARTS	ELEMENTARY	3.69
	TIME MANAGER	RADIO SHACK	VOCATIONAL	SECONDARY	2.05
	TRS-80 CHEMISTRY LAB VOLUME 1	RADIO SHACK	SCIENCE	MIDDLE	4.20
			SCIENCE	SECONDARY	4.53
	VECTOR ADDITION	RADIO SHACK	MATHEMATICS	MIDDLE	2.20
			MATHEMATICS	SECONDARY	3.40
			SCIENCE	SECONDARY	3.94
			LANGUAGE ARTS	MIDDLE	3.58
			LANGUAGE ARTS	SECONDARY	3.36
			LANGUAGE ARTS	ELEMENTARY	4.02
	WORDS FOR THE WISE	TEACH YOURSELF COMP. SOFTWARE	LANGUAGE ARTS	ELEMENTARY	3.81
	ALPHA KEY	RADIO SHACK	READING	K-2	3.68
	ALPINE SKIER	DATA COMMAND	READING	5 9	3.73
	BLACK BEAUTY	PENDULUM PRESS	READING	6-9	3.70
	CALL OF THE WILD	PENDULUM PRESS	READING	6-9	3.54
	COMPUTER MANAGEMENT	ZWEIG	READING	K-6	4.50
	DIASCRIPTIVE READING	EDUCATIONAL ACTIVITI	READING	3-9	4.38
	DR JEKYL & MR HYDE	PENDULUM PRESS	READING	4-9	3.55
	DRACULA	PENDULUM PRESS	READING	6-9	3.75
	FRANKENSTEIN	PENDULUM PRESS	READING	6-9	2.54
	HUCKLEBERRY FINN	PENDULUM PRESS	READING	5-12	2.92
	MOBY DICK	PENDULUM PRESS	READING	5,9	2.63
	PIK PEK PUT	DATA COMMAND	READING	3-9	3.86
	READ COMP AUTO MECHA	DORSETT ED SYSTEMS	READING	9-12	3.23
	READ COMP CLASSICS	DORSETT ED SYSTEMS	READING	7-9	3.23
	READ CONTENT AREA	EDUCATIONAL ACTIVITI	READING	5,9	3.03
	READ HOMONYMS CONTEX	RANDOM HOUSE	READING	3-6	3.14
	READING COMPREHENSION	DORSETT ED SYSTEMS	READING	4-12	3.31

COURSEWARE EVALUATED 1982/83

HARDWARE	PACKAGE TITLE	PUBLISHER	SUBJECT	GRADE LEVEL	AVG.
TRS-80 Cont'd	READING SKILLS LAB A	NIS	READING	K-4	3.31
	READING WORD BLASTER	RANDOM HOUSE INC	READING	1-10	4.36
	READING WORD FOCUS	RANDOM HOUSE INC	READING	3-10	3.63
	RED BADGE OF COURAGE	PENDULUM PRESS	READING	5-9	3.60
	RIDDLE? ME THIS	DATA COMMAND	READING	5	3.68
	STORY MIX ONE	MICRO SCHL BERTAMAX	READING	K-3	4.06
	TANK TACTICS	DATA COMMAND	READING	5	3.03
	THE TIME MACHINE	PENDULUM PRESS	READING	5-9	3.71
	TOM SAWYER	PENDULUM PRESS	READING	5-9	3.77
	TREASURE ISLAND	PENDULUM PRESS	READING	5-9	4.03
	20,000 LEAGUES UNDER	PENDULUM PRESS	READING	4-10	2.69
	WEIRD & WACKY WORLD	EDUCATIONAL ACTIVITI	READING	2-4	3.04
	BAKER MATH DECIMAL	BOB BAKER SOFTWARE	MATH	3-9	2.83
	BAKER MATH FRACTION	BOB BAKER SOFTWARE	MATH	3-9	1.99
	BAKER MATH NUMBO-JUM	BOB BAKER SOFTWARE	MATH	3-9	3.84
	BASIC MATH FRACTS DRL	RANDOM HOUSE INC	MATH	K-5	4.36
	ELEM MATH I, II, IV	MICRO LEARNINGWARE	MATH	1-10	2.69
	ESSENTIAL MATH PRGM	RADIO SHACK	MATH	K-9	3.58
	FISH ADD SUBTRACT	NIS SOFTWARE	MATH	2-4	3.11
	FRACTIONS	EDUCATIONAL MICROSYS	MATH	5-9	2.08
	GALAXY MATH FACTS	RANDOM HOUSE INC	MATH	1-8	4.33
	GETTING BASICS 1 & 2	NIS	MATH	5,9	2.55
	GRAPHICAL ANALYSIS	RADIO SHACK	MATH	11,12	3.73
	GRAPHS IN PHYSICS	RADIO SHACK	MATH	11,12	3.58
	INTEGRAL CALCULUS	RADIO SHACK	MATH	12	4.66
	JR HIGH MATH PKG	MICRO LEARNINGWARE	MATH	5-8	2.63
	K-8 MATH	RADIO SHACK	MATH	3-9	3.79
	K-8 MATH WITH STUDENT	RADIO SHACK	MATH	K-10	3.90
	K-8 MATH WORKSHEET	RADIO SHACK	MATH	K-9	3.93
	MATH BASIC FACT/GAME	RANDOM HOUSE INC	MATH	3-9	4.50
	MATH FLASH FACTS	RANDOM HOUSE INC	MATH	3-9	4.12
	MATH LAB I & II	NIS	MATH	4-12	4.67
	MATH SEQUENCES	MILLIKEN	MATH	K-9	3.75
	METRIC/ENGLISH CONV	EDUCATIONAL MICROSYST	MATH	7-12	1.93
	PROBLEM SOLVING MATH	MICRO PRGM BERIAMAX	MATH	3-6	4.25
	QUICK QUIZ	RADIO SHACK	MATH	3,5,9	3.67
	READ SOLV & DRIL SKL	ACTIVITY RECORDS INC	MATH	3-12	4.49
	7-12 MATH	RADIO SHACK	MATH	5,9	3.49
	TELLING TIME HOUR CL	MICRO PRGM BERIAMAX	MATH	K-4	2.95
	TIMES TABLS SEQUENCE	NIS	MATH	4-6	3.04

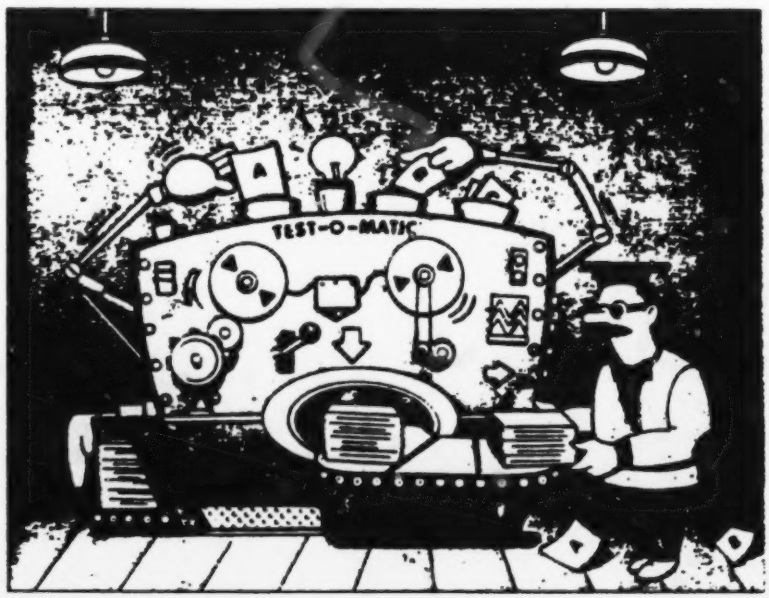
COURSEWARE EVALUATED 1982/83

HARDWARE	PACKAGE TITLE	PUBLISHER	SUBJECT	GRADE LEVEL	AVG.
TRS-80 Cont'd	WEIRD & WACKY WORLD PR	EDUCATIONAL ACTIVITI	MATH	3-8	3.77
	WHOLE NUM: ADD SUB	EDUCATIONAL MICRO SY	MATH	1-10	3.77

TEST WRITING MADE SIMPLE

GENERATE TESTS AND WORKSHEETS ELECTRONICALLY

BY ERICA LODISH



Most teachers look forward to writing tests about as much as their students look forward to taking them. The same is true for worksheets. Between daily assignments, end-of-chapter quizzes, make-up tests, and study guides, most teachers generate a blizzard of paper.

To cut down on the paperwork, you can buy packets of worksheets and tests from textbook publishers. But when you use commercially prepared materials, you end up emphasizing what the textbook publisher thinks you should, not what you think is best. Teachers who are well organized save their mimeographed tests and worksheets from year to year, but to reuse materials you often have to retype them.

Why not let a computer prepare the materials for you? With the right software, generating a worksheet or a test can be easy. And once the materials have been created, they can be saved for future use, as well as edited and updated without having to be rewritten. With the right program, the time you save will pay for the program many times over.

USING THE SOFTWARE

Test and worksheet generators exist in a variety of formats. Some programs are devoted to a single subject area and they contain files of questions or problems that can be selected by the teacher to produce a test or worksheet. Other programs use a "shell" to be filled in by the teacher; these can be used in any number of curriculum areas and grade levels. Most of these program can be used to do some or all of the following:

- **Print out materials**—After creating a test or worksheet, you can print it out for duplication. Some programs allow for random distribution of questions so that more than one test can be produced on the same information; this option is useful for creating make-up tests. Others let you create individual instructions and page headings. Student-response sheets and teacher answer-keys may also be options.
- **On-screen tests**—A few of the software packages allow the students to take tests on the computer. The feedback ranges from telling the student the number or percentage of correct answers to providing an instructional management program for the teacher that records how students do.
- **Study guides**—How often do students ask, "What should I study?" or "What's on the test?" Some of the software packages allow you to print out study guides that will answer those persistent questions. And with all the programs you can prepare sample test questions for study purposes.

FEATURES TO LOOK FOR

Whether the test and worksheet generator you want is subject-specific or a shell, there are a number of features to consider when evaluating them:

- **Data disks**—Find out if the program requires you to initialize the data

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disks. Some programs will initialize your disks for you. With others you will need to initialize disks yourself using the computer's disk operating system.

- **Compatibility**—Make sure the software is compatible not only with your computer, but with your printer too. Not all test generators work with every printer. Read the documentation. Ask the publisher, or better still, try the program on your printer before you buy. Look for double-strike and emphasized-print modes if you plan to put mimeograph forms directly into your printer.
- **Ease of use**—Look for menu-driven software with clearly written documentation! If it takes hours to decipher how to use the program, it isn't worth buying. After all, you are getting this package to save time. When preparing tests and worksheets, are there warning messages to prevent the loss of input? Is it easy to edit? Is the space available for questions reasonable? Do you fill in fields of information with helpful prompts? You may also want to make sure that the software saves test items as you enter them and not all at once at the end. Find out if the program requires a lot of disk switching and rebooting.
- **Variety of question format**—Check and see how many types of test questions you can create. Fill-in-the-blank questions, short-answer, rearranging, multiple-choice, or matching are some possibilities. Even if you can produce tests in all these ways, some programs do not allow you to mix different types of questions in one document. If generating test questions in random order is important for you, check for this feature too.

SOME POPULAR PROGRAMS

The following reviews will give you an overview of some of the test and worksheet generators available.

P.D.Q

Apple II series, $44.95

Micro Power & Light, 12820 Hillcrest Rd., Suite 219, Dallas, TX 75230; 214 239-6620

This menu-driven test and worksheet generator is designed to allow teachers to create fill-in-the-blank questions and multiple-choice questions, and rearranging exercises—where students put test items in order—in any subject area. Students can answer questions at the computer or on a printed copy. Tests, worksheets, answer sheets, and student records can be printed. Multiple copies of student disks can be made for many computers with the program initializing the student disks. Tests can include a variety of question formats.

Though the program can do a lot, there are some drawbacks. The documentation is confusing. Multiple disks are needed. And the program requires the use of passwords and detailed labeling of disks. The program can be easily overwritten.

TESTMASTER

Commodore 64, Commodore PET, Apple II series, IBM PC/PCjr, $35

Midwest Software, Box 214, Farmington, MI 48024; 313/477-0897

Testmaster is a test generator which can be used to write, edit, and save test items for all subjects. Questions can be multiple choice, fill-in-the-blank, or short-answer and can be mixed in a single test. Tests can be viewed on the screen for checking or testing purposes and be printed out. Test questions can be printed in random order. Answer keys and response sheets can be printed.

The program is menu-driven, automatically creates data disks, and is easy to use. The documentation, which is a little confusing, is made clearer by the friendly software. The documentation needs photos of sample screens.

THE EASY QUIZ MAKER

Apple II series $75 for two copies and backup

Compress, PO Box 102, Wentworth, NH 03282, 603 764-5831

The questions entered in this program can be multiple choice, true/false, or fill-in-the-blank, or a mixture of the three. The teacher types in the entire question without any prompts. Test files can be edited or deleted. Tests can be given on screen. Tests, answer keys, and student response sheets can be printed. Questions can be given or printed in random order.

As the title implies, this utility is easy to handle. It is menu-driven with lots of warning messages at critical times. This is fortunate because the documentation is short and sketchy. Two features are particularly helpful: The program initializes data disks, for you, and file disks are cataloged so you can view the names of the tests on the disk.

THE EA MATHEMATICS WORKSHEET GENERATOR

Apple II series, $59.95

Educational Activities, 1937 Grand Ave., Baldwin, NY 11510; 516/223-4666

This program generates math tests and worksheets covering addition, subtraction, multiplication, and division. Between 17 and 19 levels of difficulty are available for each arithmetic operation. When selecting difficulty level, a sample program is displayed on the screen. Each test can have a variety of levels, but not a variety of operations. Teacher's answer keys can also be printed.

The EA Mathematics Worksheet Generator is menu-driven and simple to run. The documentation contains screen samples which help as a guide for creating the worksheets. The software is friendly enough to operate independently. However, teachers cannot save worksheets. Nor are there special print options for printing onto mimeograph forms.

MATHEMATICS WORKSHEET GENERATOR

Apple II series, $54.99

DCH, 125 Spring St., Lexington, MA 02173, 617 862-6650

Creates math tests and worksheets on the four basic arithmetic operations. The program uses the computer's ability to generate problems using random numbers. Tests and answer keys can be printed out. The skill level is controlled by choosing such items as the number of digits, regrouping, and the maximum and min-

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mum value of the digits. Other options available include fact problems, zero placement, and the choice of remainders. A worksheet can be designed with a variety of operations. In this case, the problems will be grouped by operation and not generated at random.

This math worksheet generator is flexible. The user can save up to nine tests on the program disk. Once the user decides to add a new test to a full file, the last one is replaced. There is no way to create data disks to save more worksheets. This program has very useful print options, including double-strike and emphasized print modes. Double-width print is also an option. The documentation is comprehensive and includes sample worksheets.

THE EARTH SCIENCE TEST MAKER
Apple II series, $85
J & S Software, 140 Reid Ave., Port Washington, NY 11050; 516/944-9304

This is a menu-driven test-making program that allows the user to create earth science tests by selecting questions from a bank of stored questions on four master disks. There are ten major earth science topics covered. Each topic area offers 53 to 90 questions. The questions are in multiple-choice format. Though designed for science, teachers in any subject area can use this program because it includes a shell for users to create their own tests. Tests and answer keys can be printed.

This is a versatile test generator for a subject-oriented piece of software. The program will initialize data disks for the user. Each test item is saved immediately after it is entered. And the software comes with a copy of all the questions in the test bank, which would be especially useful to those who need to create midterm and final exams in earth science.

INDIVIDUALIZED STUDY MASTER
Apple II series
$59.95
Random House, 201 E. 50th St.; New York, NY 10017; 212/751-2600

Study guides and worksheets can be created with this software for any grade level or content area that covers specific terminology or vocabulary to be learned. The teacher enters the term, the definition, the source, and a question. From this information, four different varieties of study guides can be printed and seven varieties of worksheets. Worksheets include: write the definition, multiple choice, matching, yes and no, fill-in-the-blanks, answer the question, select the correct spelling, or a mixture of question types. Users must initialize their own data disks.

This menu-driven software is easy to use. The guide is very organized offering screen samples, objectives, suggested activities, forms to use when preparing worksheets, and sample worksheets and study guides. A glossary of terms is also included. The program uses a master disk and a data disk. The data disk can hold up to 18 study masters. Study guides and worksheets can be printed but no answer keys are available.

TESTMASTER
Apple II series, $89.95
Lovesoft, PO Box 2116, Muscle Shoals, AL 35661; 205/766-2799

This test generator allows the user to create tests, score tests, and keep class records in any subject area. The tests can be administered on-screen or printed out. The software will keep records from disk or results can be entered manually. Test questions are limited to ten lines and choices of up to four lines. Multiple-choice, fill-in-the-blank, and true/false questions can be entered, and answer keys may also be printed.

Testmaster is an excellent and flexible test creator. The software program offers a tutorial for the user. While not menu-driven, there are many prompts and warning signals regarding what drive and what disk should be used. Test file disks are initialized with a copy program and student record disks are initialized by the master program.

QUICK TAKES ON SOFTWARE— NEW AND NOTEWORTHY

Welcome to FAMILY COMPUTING's Software Guide, the most comprehensive listing available of two dozen of the newest, most noteworthy, and/or best programs on the market. Our reviewers include families from all over the country who have judged the software according to the following criteria: long-term benefits and applications, adaptability, and advantages of using a computer for a given task. More detailed reviews follow the chart. Unless otherwise noted, all programs are in disk format. Minimum memory requirements are 48K for Apple II series, 48K for Atari, 128K for IBM PC/PC*jr* or compatibles, and 128K for Macintosh.

Here's a rundown of the rating categories and what they mean: **O** = Overall performance, given the limitations and capacities of the particular computer for which the software is intended. **D** = Documentation, or the instructions and literature that accompany a program. **EH** = Error-handling, the software's capacity to accommodate errors made by the user—an especially important consideration with software for younger users. **PS** = Play system, in the games reviews, the quality of the game design and the game's playability. **GQ** = Graphics quality, also evaluated in light of each particular brand's graphics capabilities. **EU** = Ease of use after the initial learning period, which varies from computer to computer. **V** = Value for money, or how the software measures up to its price.

HOME BUSINESS & PRODUCTIVITY

Title Publisher Price	Brief description	Hardware/ Equipment required	Backup policy	Ratings O	D	EH	GQ	EU	V
FANTAVISION Broderbund Software 17 Paul Drive San Rafael, CA 94903 (415) 479-1170 $50 ©1985	A rarity—powerful software that's also easy to use. You can create artistically complex animation in minutes because the program does the hard work. A tool that's fun.♦ —FRANK	64K Apple. Joystick, KoalaPad, or mouse. Color monitor recommended.	90-day warranty. $7.50 thereafter. User can make one backup.	★★★★	★★★★	★★★★	★★★★	E	★★★★
PRINCE Baudville 1001 Medical Park Drive S.E. Grand Rapids, MI 49506 (616) 957-3036 $70 ©1985	Print color pictures using a regular dot-matrix printer? Yes—with *Prince*, a utility that includes the software and ribbons you need. It also makes transfers for clothing. —FRANK	64K Apple. C.Itoh 8510, Epson MX-80/ RX-80/FX-80, Imagewriter, Imagewriter II, or NEC 8023.	90-day warranty. $7.50 thereafter or for backup.	★★★	★★★★	★★★★	★★★	A	★★★
SLIDE SHOW MAGICIAN 1.3 Magnum Software 21115 Devonshire St. Chatsworth, CA 91311 (818) 700-0510 $60 ©1984, 1985	String together *MacPaint* pictures in any sequence, adding visual magic with the cinematic "Special Effects" editor. Great for animated displays, video greeting cards, and more. —AKER	Macintosh.	$10 for replacement disk.	★★★	★★	★★★	★★★	E	★★★
SYLVIA PORTER'S YOUR PERSONAL FINANCIAL PLANNER Timeworks, Inc. 444 Lake Cook Road Deerfield, IL 60015 (312) 948-9200 $60–$130 ©1984	Write checks, maintain your budget, track cash and credit expenditures, and project your financial needs. Helps do taxes. Refreshingly complete; did more than we expected.♦ —SUMMERS	Reviewed on C 64. Also for Apple, C 128, IBM PC/PC*jr*.	90-day warranty.	★★★★	★★★★	★★★★	N/A	A	★★★
VP-PLANNER Paperback Software 2612 Eighth St. Berkeley, CA 94710 (415) 644-2116 $100 ©1985	A powerful spreadsheet program at a reasonable price. This *Lotus 1-2-3* work-alike can read files from that package. Will take you from beginning to advanced use.♦ —SUMMERS	256K IBM PC/PC*jr* and compatibles. Graphics adapter card recommended.	90-day warranty. $5 thereafter. $10 for non-copy-protected backup.	★★★★	★★★★	★★★★	★★★★	A	★★★★

RATINGS KEY O Overall performance. D Documentation. EH Error-handling. GQ Graphics quality. EU Ease of use. V Value for money. ★ Poor. ★★ Average. ★★★ Good. ★★★★ Excellent. N/A Not applicable. E Easy. A Average. D Difficult. ♦ Longer review follows chart

WHAT'S IN STORE
SOFTWARE GUIDE

EDUCATION/FUN LEARNING

Title Publisher Price	Brief description	Hardware/ Equipment required	Backup policy	Ratings ●	 D	 EH	 GQ	 EU	 V
FIX IT Random House Software 201 E. 50th St. New York, NY 10022 (800) 638-6460 $30–$40 ©1985	Aims to teach logic and problem-solving but falls short. You combine parts of "machines" so they work correctly. 200 puzzles for all ages, but gets tiresome. —MORRIS	Reviewed on Apple. Also for C 64/128. Optional joystick, mouse, and color monitor.	90-day warranty. $5 thereafter up to one year. $12 for backup.	★ ★	★ ★	★ ★	★ ★	@	★ ★
GARFIELD DOUBLE DARES Random House Software *(See above for address and phone)* $40 ©1985	Reminds me of the word game Boggle: the object is to make words from scrambled letters. Challenging for ages 6–12, but rather dry, even with Garfield of comic-strip fame. —FRANK	64K Apple.	90-day warranty. $5 thereafter up to one year. $12 for backup.	★ ★	★ ★ ★	★ ★ ★	★ ★ ★	A	★ ★
HOMEWORK HELPER: MATH WORD PROBLEMS Spinnaker Software One Kendall Square Cambridge, MA 02139 (617) 494-1200 $33–$50 ©1985	Helps make math problems as problem-free as possible. You know the kind: If a car travels north at 50 mph with a 10 mph head wind, how long will it take to travel 150 miles? A good adjunct to school learning for grades 7–12. —SUMMERS	Reviewed on IBM PC/ PCjr. Also for Apple, Atari 520ST, C 64/128. Color graphics card required for IBM PC.	30-day warranty. $5 thereafter.	★ ★ ★	★ ★ ★	★ ★ ★	★ ★ ★	A	★ ★ ★
HOMEWORK HELPER: WRITING Spinnaker Software *(See above for address and phone)* $33–$50 ©1985	An interactive word processor for students in grades 7–12. Asks the right questions to help with book reports and various essays.† —SUMMERS	Reviewed on C 64/128. Also for Apple, Atari 520ST, IBM PC/PCjr. Printer optional. Color graphics card required for IBM PC.	30-day warranty. $5 thereafter.	★ ★ ★ ★	★ ★ ★	★ ★ ★	N/A	E	★ ★ ★ ★
LEARNING TO WRITE: UPPERCASE LETTERS Right On Programs 1737 Veteran's Highway Central Islip, NY 11722 (516) 348-1577 $35 ©1986	Youngsters learn letter shapes and each stroke needed to write them. The learning is reinforced by colorful graphics that are animated when the child completes each letter. There's a separate package for lowercase letters. —BUMGARNER ELTGROTH	Reviewed on Apple. Also for C 64/128. Color monitor optional.	Unlimited warranty (includes user-damaged disks).	★ ★ ★	★ ★	★ ★ ★ ★	★ ★ ★ ★	E	★ ★ ★
THE NOTABLE PHANTOM Designware 185 Berry St. San Francisco, CA 94107 (415) 546-1866 $50 ©1984	By using a computer keyboard to simulate a piano's, all ages can explore the names, positions, and sounds of musical notes. Its goals are modest, but it works well.† —MORGENSTERN	Reviewed on C 64/128. Also for 64K Apple, IBM card required for IBM PC.	90-day warranty. $12 thereafter or for backup.	★ ★ ★	★ ★ ★ ★	★ ★ ★	★ ★ ★	E	★ ★ ★
PAINT WITH WORDS MECC 3490 Lexington Ave. N. St. Paul, MN 55112 (612) 481-3500 $30 ©1984	Explains the concepts of various words by producing pictures on-screen. As children use this program more, they have more fun learning. Highly motivating.† —BUMGARNER ELTGROTH	64K Apple. Joystick or mouse optional.	Unlimited warranty (includes user-damaged disks).	★ ★ ★ ★	★ ★ ★ ★	★ ★ ★	★ ★ ★	E	★ ★ ★ ★
PICTURE PERFECT Mindplay 82 Montvale Ave. Stoneham, MA 02180 (617) 438-5454 $40 ©1984	Here's a decent beginner's program for drawing on-screen and then printing out. Also contains a library of pictures to enhance or begin compositions. For ages 4+. —BUMGARNER ELTGROTH	Reviewed on Apple. Also for IBM PC/PCjr. Joystick or mouse.	90-day warranty. $10 thereafter up to one year. $7.50 for backup within 90 days.	★ ★	★ ★ ★	★ ★ ★ ★	★ ★ ★	A	★ ★
SCIENCE TOOLKIT: MASTER MODULE Broderbund Software 17 Paul Drive San Rafael, CA 94903 (415) 479-1170 $60 ©1985	Investigate the hows and whys of light and temperature with the probes and program provided. With more than 20 intriguing experiments, this package is appropriate for the curious, especially ages 10–15.† —MORRIS	64K Apple. Apple II plus requires 9-pin joystick-port adapter.	90-day warranty. $7.50 (disk), $22.50 (interface), or $17.50 (probes) thereafter.	★ ★ ★ ★	★ ★ ★ ★	★ ★ ★ ★	★ ★ ★	A	★ ★ ★ ★

RATINGS KEY ● Overall performance. D Documentation. EH Error-handling. GQ Graphics quality. EU Ease of use. V Value for money. ★ Poor. ★★ Average. ★★★ Good. ★★★★ Excellent. N/A Not applicable. E Easy. A Average. D Difficult. @ Easy to difficult, depending on puzzle. † Longer review follows chart

GAMES REVIEWS BY JAMES DELSON

Title Publisher Price	Brief description	Hardware/ Equipment required	Backup policy	Ratings O	D	PS	GQ	EU	V
APBA MAJOR LEAGUE PLAYERS BASEBALL Random House Software 201 E. 50th St. New York, NY 10022 (800) 638-6460 $90 ©1985	Using exhaustively detailed stats for every current major leaguer, manage teams through games, series, or seasons. State-of-the-art strategy, but weak graphics. Good for both adults and kids ages 10+.	IBM PC/PCjr. Apple version planned.	90-day warranty. $5 thereafter. $22 for master disk backup. $12 for data disk backup.	★ ★ ★	★ ★ ★ ★	★ ★ ★ ★	★	E	★ ★
ACROJET MicroProse Software 120 Lakefront Drive Hunt Valley, MD 21030 (301) 667-1151 $35 ©1985	Negotiate a series of aerobatic race courses with this sporty, stunt-flying simulator. Some features: 1–4 players and 10 different races. For ages 12+ (8+ with adult supervison).	C 64/128. Also for Apple. Atari. IBM PC/ PCjr. Joystick(s).	90-day warranty. $10 thereafter.	★ ★ ★	★ ★ ★ ★	★ ★ ★	★ ★	D	★ ★ ★
BALANCE OF POWER Mindscape, Inc. 3444 Dundee Road Northbrook, IL 60062 (312) 480-7667 $50 ©1985	A geopolitical strategy game of nuclear brinkmanship. You are the United States or the Soviet Union as you try to gain political points without "pushing the button." For ages 12+.♦	Macintosh.	90-day warranty. $10 thereafter.	★ ★ ★ ★	★ ★ ★ ★	★ ★ ★	★ ★	D	★ ★ ★
THE BARD'S TALE Electronic Arts 2755 Campus Drive San Mateo, CA 94403 (415) 571-7171 $40–$45 ©1985	Are you experienced enough to attempt the ultimate challenge in a 16-level dungeon? That's your goal in this *Wizardry*-like role-playing adventure. Great, long-playing fun for ages 12+.♦	Reviewed on Apple. Also for C 64/128.	90-day warranty. $7.50 thereafter or for backup.	★ ★ ★ ★	★ ★ ★	★ ★ ★	★ ★	A	★ ★ ★
FIGHT NIGHT Accolade, Inc. 20863 Stevens Creek Blvd. Cupertino, CA 95014 (408) 446-5757 $30–$35 ©1985	Here's the first boxing construction kit. Build your own boxer from "spare parts." The control system is limited, but the action is exciting. Lots of arcade fun for ages 8+.	Reviewed on C 64/128. Also for Apple. Joystick optional.	90-day warranty. $6 thereafter. $10 for backup.	★ ★ ★	★ ★ ★	★	★ ★	E	★ ★ ★
HEART OF AFRICA Electronic Arts *(See above for address and phone)* $33 ©1985	Quest through the Africa of the 1890s in search of a hidden tomb. This exceptionally enjoyable role-playing adventure is flawed by its use of stereotypes.♦	C 64/128. Joystick.	90-day warranty. $7.50 thereafter or for backup.	★	★ ★ ★ ★	★ ★ ★ ★	★ ★ ★	A	★
THE LITTLE COMPUTER PEOPLE RESEARCH PROJECT Activision 2350 Bayshore Frontage Road Mountain View, CA 94039 (415) 960-0410 $25–$35 ©1985	An "entertainment" that explores the home life of your computer's "inhabitant." He sets up house, eats, plays the piano, dances, feeds his dog, and is your "friend." Not a game, but a form of kinetic art for ages 4+.	Reviewed on C 64/128. Also for Apple.	6-month warranty. $7 thereafter.	★ ★ ★	★ ★ ★	★ ★ ★	★ ★	E	★ ★ ★
MINDWHEEL Synapse, a division of Broderbund Software 17 Paul Drive San Rafael, CA 94903 (415) 479-1170 $40–$45 ©1984	With constant feedback for impatient gamers, this text-only adventure is easier to get into than most. 60 pages of documentation help players with an entertaining science-fiction story. Fun for ages 12+.	Reviewed on IBM PC/ PCjr. Also for Apple. Atari with two disk drives. C 64/128.	90-day warranty. $7.50 thereafter.	★ ★ ★	★ ★ ★ ★	★ ★ ★	N/A	E	★ ★ ★
PSION CHESS Psion Inc. 40 Lindeman Drive Trumbull, CT 06611 (203) 371-4371 $60 ©1984, 1985	Incredible 3-D graphics enhance this excellent chess software. Includes 28 play levels, 50 classic games to study, and can be played in six foreign languages. For ages 10+.♦	Reviewed on Macintosh. Also for 256K IBM PC/PCjr.	30-day warranty. $10 thereafter or for backup. IBM user makes backup.	★ ★ ★ ★	★ ★	★ ★ ★ ★	★ ★ ★	E	★ ★ ★
SPY VS SPY II: THE ISLAND CAPER First Star Software 18 E. 41st St. New York, NY 10017 (212) 532-4666 $30 ©1985	You compete to find secret missile parts and escape with them to a waiting submarine. Set traps for each other and avoid the quicksand. Uses varying levels. A treat for ages 8+.	Reviewed on C 64/128. Also for Atari.	90-day warranty. $7 if user-damaged or for backup.	★ ★ ★	★ ★ ★	★ ★ ★ ★	★ ★	A	★ ★ ★

RATINGS KEY O Overall performance. D Documentation. PS Play system. GQ Graphics quality. EU Ease of use. V Value for money. ★ Poor. ★★ Average. ★★★ Good. ★★★★ Excellent. N/A Not applicable. E Easy. A Average. D Difficult. ♦ Longer review follows chart.

This chart represents the initial list of software developed by schools in the AUM. The software is being marketed through a program called the Apple Academic Courseware Exchange that sells programs for about $8 to $30 through Kinko Graphics stores, located in many college communities throughout the U.S.

CONSORTIUM SOFTWARE

PRODUCT	TYPE	VERSION	REQUIREMENTS	DESCRIPTION
Appletones Kiewit Computation Center Dartmouth College Hanover, NH 03755 *Donald Z. Spicer*	*Application:* Music	Version 2.0 5/12/85	128K	Teaches the importance of four things in the composition and arrangement of music: repetition, silence, changes in volume, and timbre
Atlas and Overlay Kiewit Computation Center Dartmouth College Hanover, NH 03755 *Donald Z. Spicer*	*Tool:* General	Atlas: 0.22 6/19/85 Overlay 1/25/85	128K	Pictorial-atlas program
Binary Trees Kiewit Computation Center Dartmouth College Hanover, NH 03755 *Donald Z. Spicer*	*Application:* Computer Science	Version 2.2 12/12/85	128K	Provides practice with binary trees, by means of graphic representations
CLR Anova Student Version Clear Lake Research 5615 Morningside #127 Houston, TX 77005 *David M. Lane*	*Application:* Statistics (particularly psychology)		512K	Analysis-of-variance program that plots interactions and computes a variety of follow-up tests
Drill Kiewit Computation Center Dartmouth College Hanover, NH 03755 *Donald Z. Spicer*	*Tool* General	Version 2.0 5/20/85	128K	General drill program for any course in which text- and/or picture-based drill is important
Event Tutor Kiewit Computation Center Dartmouth College Hanover, NH 03755 *Donald Z. Spicer*	*Application:* Macintosh Programming	Version 1.1 5/9/85	128K	Helps programmers learn about Macintosh "events"
Huckel Molecular Orbitals Franklin and Marshall College Department of Chemistry Lancaster, PA 17604 *John J. Farrell*	*Application:* Chemistry	Version 1 3/1/86	128K, Finder 4.1 or earlier, Pascal, printer	Calculates energy eigenvalues, eigenvectors, and pi-electron charge densities using the assumptions of simple Huckel molecular orbital theory

PRODUCT	TYPE	VERSION	REQUIREMENTS	DESCRIPTION
MacSimplex University of California, Santa Barbara Department of Mathematics Santa Barbara CA 93106 *John E. Doner*	*Application:* Operations Research, Math	Version 1.62 1/21/86	128K, program to print text files: MacWrite, File, or Edit (this requirement will be eliminated in next version)	A tool for students of linear programming and linear algebra
MacVoice Carnegie Mellon University Department of Music 5000 Forbes Avenue Pittsburgh, PA 15213 *Marilyn Taft Thomas*	*Application:* Music Theory	Version 1.0, 1985	128K	Designed to assist music-theory students in writing four-voice chorales, according to the guidelines of 17th- and 18th-century practices
Mozart Kiewit Computation Center Dartmouth College Hanover, NH 03755 *Donald Z. Spicer*	*Application:* Music	Version 2.0 5/12/85	128K	Introductory music-composition program
PSI (Problem Solving Interpreter) Reed College Development Lab Portland, OR 97202 *Marianne Colgrove*	*Tools:* General Science/ Math	Version 86.03.15	128K, Finder 4.1 or higher	A simple interpretive language designed specifically for problem solving, calculations, and graphical modeling
Reed Applications I Reed College Development Lab Portland, OR 97202 *Marianne Colgrove*	*Tools:* General and Mathematics	Version 86.03.15	128K, Finder 4.1 or higher	Includes several utility, academic, and iconographic applications created with the Rascal Development System
Reed Applications II Reed College Development Lab Portland, OR 97202 *Marianne Colgrove*	*Applications:* Math, Science, Music	Version 86.03.15	128K, Finder 4.1 or higher	Includes several utility, academic, and iconographic applications created with the Rascal Development System
Skel Kiewit Computation Center Dartmouth College Hanover, NH 03755 *Donald Z. Spicer*	*Tool with source code:* Macintosh Programming	Version 2.4 5/9/85	128K	Skeleton demonstration Macintosh program to illustrate the basic code for handling a simple Macintosh user interface
The SmallGol Compiler University of California, Irvine 3018 Mountain View Drive Laguna Beach, CA 92651 *Thomas A. Standish*	*Application:* Computer Science	Version 1.0 10/1/86	128K Finder 4.1	An animated compiler
Tools for Writers Drexel University 1 Dartmouth Circle Swarthmore, PA 19081 *Eva M. Thury*	*Application:* English Composition	Version 1.1 4/1/86	128K, Finder 1.1 or higher	Allows students to perform checks and diagnostic tests on their own writing
Venn Kiewit Computation Center Dartmouth College Hanover, NH 03755 *Donald Z. Spicer*	*Application:* Philosophy	Version 2.0 5/22/85	128K	Program for teaching syllogisms and Venn diagrams in introductory philosophy courses
The Would-Be Gentleman Stanford University IRIS, Cypress Hall E-7 Stanford, CA 94305 *Barbara Jasinski*	*Application:* History/Politics	Version 4.1 3/14/86	512K recommended, MiniFinder 4.1	Historical simulation

SOFTWARE: SIDE BY SIDE

DATA BASE PROGRAMS

EDITOR'S NOTE: Each month, Software: Side by Side takes a comparative look at different software packages within the content of "Computers in the Curriculum." The packages are reviewed by an educator with extensive educational computing experience. This month's data bases, all of which can be used for organizing research information, are rated on a scale of 1-5 (1 = unsatisfactory, 2 = average, 3 = good, 4 = very good, 5 = excellent).

Readers should realize that this selection of programs does not represent the entire spectrum of software available.

PROGRAM/ PRICE/ SOURCE/ COPYRIGHT	COMPUTERS	LEVEL/ DESCRIPTION	Expandability*	Screen Display	Fit For Students	Ease of Learning	Ease of Use	Support Materials	Overall Value	REVIEWER'S COMMENTS/ PUBLISHER'S RESPONSE
Scholastic PFS: File $99.95, lab pack of five for $185 (Scholastic Software, 730 Broadway, New York, NY 10003) 1984	Apple II family (64K), IBM PC/PCjr (128K)	**Grades 6-12** Form must be first designed on the screen. Then data can be entered into the form. Allows users to copy files from disk to disk. Can be used in conjunction with the other Scholastic PFS programs (*Graph, Write, Access, Plan, Proof* and *Report*). Holds up to 1000 records per disk.	4	3	5	4	4	5	5	**Reviewer's Comments:** This is a good package to introduce data bases. It is easy to learn and to use. It also comes with a teriffic, attractively-packaged manual and can access many curriculum-specific data bases published by Scholastic. There are a few problem areas, though. Copying files or changing form design is a long and tedious process. Also, the program does not contain a word wrap feature. ***Publisher's Response:*** *Copying files is fast and easy using the Copy Whole diskette feature. While changing files or form design takes time, it is a straightforward and easy process.*
Friendly Filer $54.95, lab pack of 5 for $109.95 (Grolier, Sherman Turnpike, Dept. 333, Danbury, CT 06816) 1984	Apple II family (64K), Commodore 64, IBM PC/PCjr (64K)	**Grades 4-12** A one-disk data base with an interactive tutorial and a game where students use the sorting and selection functions to search through a small data base on twenty animals. Questions are selected at random. Holds up to 350 records per file.	2	4	5	5	5	5	5	**Reviewer's Comments:** Though it is not nearly as flexible as the other programs reviewed, *Friendly Filer* far surpasses them in terms of ease of use and fitness for students. Students do not have to memorize commands. It is so easy to use that reviewer did not have to consult the manual. Instructions are presented on screen with clear and precise prompting. The screen display is uncluttered. However, the program can only generate index card-type reports instead of column reports. Also, each file holds only seven fields. ***Publisher's Response:*** *Publisher has no response.*

Reviewed by Phil Ingber, computer coordinator, Nyack (NY) Public Schools.

Rapid Recall: An Electronic Notebook **$49.95** (Microcomputer Workshops Courseware, 225 Westchester Ave., Port Chester, NY 10573) 1985	IBM PC PCjr (128K), Apple II series (64K)	**Grades 7-12** Creates electronic notebooks for storing and retrieving information. Each page of the notebook contains 56 blank lines. Provides word processing functions. Needs only one disk drive to operate. Disk includes a tutorial. Users create new fields as they need them. File size depends on record size.		4						2		3	3	3			2			1		**Reviewer's Comments:** This program's on-screen tutorial is quite good and is very easy to use. It is not cluttered with useless information that only the technicians need to know. The program uses memory inefficiently by saving in blocks of 56 lines, whether you use one or 56 lines. However, the word processing powers of *Rapid Recall* shine. It has a word wrap, erase blocks--all of the features which make data entry easier than many data base management programs. The manual is a problem: It is simply a few Xerox-copied pages of instructions. ***Publisher's Response:*** *The current documentation contains twenty-five pages which we feel is more than a few. Within the next two months, the documentation will be put in a printed booklet form.*
AppleWorks **$250** (Apple, 20525 Mariani Ave., Cupertino, CA 95014) 1983	Apple II family (64K)	**Grades 9-12** An integrated data base, spreadsheet, and word processing program. User can move back and forth at will among these three software applications and the files they create. Also allows users to combine the three kinds of information. Has tutorial disk and manual. Holds up to 1,350 records per file.		5				5	5	4		4							3	3			**Reviewer's Comments:** *Appleworks* is best suited for a two-drive machine with 128K or better. Without the second drive, a great deal of disk swapping must be done. The data base program is extremely flexible. Record access through the "find" feature is very fast. Screen menus are easy to read and self-explanatory. In addition, the *Appleworks* program provides the user with on-screen help menus. The program is complex and will take time to learn, however, the tutorial disk and manual are excellent and helpful. ***Publisher's Response:*** *Appleworks has been used by students as young as third grade. Difference in use by third graders versus secondary students depends on how instructors design exercises. Appleworks can be used by teachers for administrative purposes.*
VersaForm **$89** (Applied Software Technology, PO Box 1769, Los Gatos, CA 95030) 1981	Apple II family (64K), IBM PC (64K)	**Grades 9-12** Requires information to be typed onto a screen "form" designed by the user. Forms then stored in data base and can be retrieved for sorting, editing, or for report writing. Three double-sided disks filled with various utilities. Comes with a users' guide for the Apple II series. Can store 1,000 records per disk.		3		3	3		3	2		2			2							**Reviewer's Comments:** The set-up procedure for *VersaForm* took almost an hour to accomplish. Following the installation guide, seven disks had to be formatted, and then the six sides of the supplied disks had to be copied onto the seven disks. The odd disk becomes a work disk. The manual is poorly planned and poorly written. Those inexperienced with data bases will have trouble understanding it. *VersaForm* does have some nice features: lookup tables, automatic checking and filing, and extremely fast random access searching. ***Publisher's Response:*** VersaForm *allows users to log accounting-type activities. It extensively checks the validity of entered data and provides quick access to selected information.*

SOFTWARE

RESOURCE GUIDE NUMBER 1

MARCH 1983

Project EduTech is designed to help educators identify technological applications that may resolve special education service delivery issues. In conjunction with this design, a variety of products have been prepared and others are planned for dissemination to educators.

This listing was compiled in response to the many requests for information on educational software. It includes an annotated list of resources, directories, periodicals, and vendors (of both courseware and adaptive devices) that provide services or products related to microcomputer software for special education. The annotations provide a brief description of the resource or periodical and a mailing address for further information.

The list of vendors is not exhaustive but represents a portion of the resources available. Specific products have not been reviewed. Inclusion in this listing does not constitute an endorsement of the vendor or recommendation for purchase of specific products but is solely for information purposes.

EduTech staff encourages you to reproduce these materials and share them with your colleagues. For more information about products and resources available from Project EduTech, please write to:

JWK INTERNATIONAL CORPORATION
Project EduTech, Log P
7617 Little River Turnpike
Annandale, VA 22003

This work was developed by JWK International under Contract No. 300-81-0424 with the Special Education Programs Office, Department of Education. The content, however, does not necessarily reflect the position or policy of SEP/ED and no official endorsement of these materials should be inferred.

RESOURCES IN COMPUTER EDUCATION (RICE)
NORTHWEST REGIONAL LABORATORY
300 SW SIXTH AVENUE
PORTLAND, OR 97204

RICE is a new on-line database providing more than 1,500 descriptions of microcomputer courseware for use in elementary and secondary education, and a file of more than 150 developers of such courseware. NWRL plans three additional databases: Computer Literacy, which will contain objectives and test items; Project Register, which will provide descriptions of K-12 computer applications in schools; and Inventory, which will contain data on hardware installations in schools.

SECTOR PROJECT
EXCEPTIONAL CHILD CENTER
UMC-68
LOGAN, UT 84322

The SECTOR project is a state funded special education computer technology resource located at Utah State University. SECTOR conducts reviews of courseware and maintains a bibliographic information base for special education.

SOFTSWAP/CUE
SMERC LIBRARY
SAN MATEO COUNTY OFFICE OF EDUCATION
333 MAIN STREET
REDWOOD CITY, CA 94063

SOFTSWAP is a joint project of the San Mateo Office of Education and Computer-Using Educators (CUE) which serves as a clearinghouse of public domain educational software. The programs are available free of charge to educators who copy them on their own disks at the Microcomputer Center. They may also be ordered at cost. SOFTSWAP also is a software exchange. Any educator who contributes an original program on a disk may request any SOFTSWAP disk in exchange. BLOCKS, the courseware development system developed at the California School for the Deaf and other courseware is available from this source.

TRACE RESEARCH AND DEVELOPMENT CENTER
WAISMAN CENTER
UNIVERSITY OF WISCONSIN-MADISON
1500 HIGHLAND AVENUE
MADISON, WI 53706

In cooperation with the Communications Aids and Systems Clinic of the University of Wisconsin, the center studies and develops techniques and aids to augment vocal skills of clinic patients. The center collects, documents, and disseminates information on these and other communication aids and techniques. Trace has published the International Software/Hardware Registry and the Non-Vocal Communication Resource Book.

VOCATIONAL STUDIES CENTER
UNIVERSITY OF WISCONSIN-MADISON
1025 WEST JOHNSON STREET
964 EDUCATIONAL SCIENCES BUILDING
MADISON, WI 53706

A list of microcomputer software programs for vocational education is available from this source. Other publications related to microcomputers in education, and vocational and career education curriculum guides also are available.

WESTERN CENTER FOR MICROCOMPUTERS
IN SPECIAL EDUCATION
1259 EL CAMINO REAL
SUITE 275
MENLO PARK, CA 94025
(415) 326-6997

The Western Center for Microcomputers in Special Education publishes a bimonthly newsletter--The Catalyst--to communicate to special education users the latest in research, developments, and products.

ASSOCIATION FOR THE DEVELOPMENT OF
COMPUTER-BASED INSTRUCTIONAL SYSTEMS (ADCIS)
ADCIS HEADQUARTERS
MILLER HALL 409
WESTERN WASHINGTON UNIVERSITY
BELLINGHAM, WA 98225

ADCIS is an international not-for-profit association for professionals in the field of instructional technology. This association facilitates communication between product developers and users to reduce repetitive efforts among developers of CAI materials. ADCIS provides a variety of membership services including annual conferences, workshops, CBI publications, and local chapter affiliations. It also sponsors several special interest groups, including Educators of the Handicapped.

THE ILLINOIS COUNCIL, CONGRESS OF ORGANIZATIONS
OF THE PHYSICALLY HANDICAPPED
COMMITTEE ON PERSONAL COMPUTERS AND THE
HANDICAPPED (COPH-2)
2030 IRVING PARK ROAD
CHICAGO, ILLINOIS 60618

The purpose of this organization is to search out, evaluate, and share information on hardware, software, software modifications, educational materials developed for disabled people, and use of computers as part of the personal development of handicapped children. Members benefit from hardware and software demonstrations, computer loans, technical assistance, a membership list (ENTER-ACT), a quarterly publication (Link and Go), the testing, manufacture, and distribution of low-cost, computer-related hardware, and all-day meetings every other month.

THE YOUNG PEOPLE'S LOGO
ASSOCIATION (YPLA)
1208 HILLSDALE DRIVE
RICHARDSON, TX 75081

YPLA is an independent, nonprofit national computer club run for and by young people. A subscription to Turtle News, a monthly magazine, is included with membership. Members also have access to a software exchange, an electronic bulletin board, and a resource library. The software exchange, for all popular personal computers, includes teacher and user developed software ranging from simple to complex games and educational and business software. Also available is software developed by and for the handicapped.

ARTIFICIAL LANGUAGE LABORATORY
MICHIGAN STATE UNIVERSITY
COMPUTER SCIENCE DEPARTMENT
EAST LANSING, MI 48824

The Artificial Language Laboratory is involved in basic research in the field of computer processing and formal linguistic structure. Research includes speech analysis and synthesis, interspecific communication, pattern recognition of human electromyographic (EMG) signals, and neurolinguistics. The Laboratory is also involved in developing vocational and educational aids for the blind.

DIRECTORIES

A number of information directories which include descriptions and reviews of educational software are listed in this section.

THE APPLE SOFTWARE DIRECTORY
VOLUME THREE: EDUCATION
WIDC VIDEO
5245 WEST DIVERSEY AVENUE
CHICAGO, IL 60639

This directory describes educational software from more than 400 vendors and is cross-referenced by subject.

CLASSROOM COMPUTER LEARNING DIRECTORY OF NEW
EDUCATIONAL COMPUTER SOFTWARE (1983-84)
PART B
CLASSROOM COMPUTER LEARNING
5615 WEST CERMAK ROAD
CICERO, ILLINOIS 60650

Formerly Classroom Computer News Directory, Part B of this Classroom Computer Learning Directory lists over 1,200 educational software packages for elementary to high school levels. Technical and ordering information is given which includes the name of the producer, the software format, compatible hardware, additional software needed, the cost and preview policy.

COMMODORE SOFTWARE ENCYCLOPEDIA
COMMODORE COMPUTER SYSTEMS
681 MOORE ROAD
KING OF PRUSSIA, PA 19406

More than 1,000 programs for business, recreation, education, and personal use for Commodore PET microcomputers are included in this directory.

INTERNATIONAL SOFTWARE/HARDWARE
REGISTRY, 1983
TRACE RESEARCH AND DEVELOPMENT CENTER
FOR THE SEVERELY COMMUNICATIVELY HANDICAPPED
UNIVERSITY OF WISCONSIN-MADISON
314 WAISMAN CENTER
1500 HIGHLAND AVENUE
MADISON, WI 53706

This Registry lists programs and modifications created or adapted for use by handicapped individuals. The Registry is divided into four sections: software for handicapped individuals, selected other software, hardware modifications, and user notes. It is updated continually by means of subscription.

MICROCOMPUTER DIRECTORY: APPLICATIONS
IN EDUCATION SETTINGS
MONROE C. GUTMAN LIBRARY
HARVARD UNIVERSITY
CAMBRIDGE, MA 02138

This directory lists 276 sites nationwide at which microcomputers are being used for instructional and administrative purposes. The projects are listed by state with a description, contact person, and funding source.

NON-VOCAL COMMUNICATION RESOURCE BOOK,
REVISED 1983
TRACE RESEARCH AND DEVELOPMENT CENTER
ON COMMUNICATION, CONTROL AND COMPUTER
ACCESS FOR SEVERELY HANDICAPPED INDIVIDUALS
UNIVERSITY OF WISCONSIN-MADISON
314 WAISMAN CENTER
1500 HIGHLAND AVENUE
MADISON, WI 53706

This Resource Book provides descriptive information on communication aids, communication boards, charts, and laptrays, communication training, assistive devices for communication, and a guide to controls. A manufacturer/aid index is appendixed. The Resource Book is updated annually.

SCHOOL MICROWARE DIRECTORY
DRESDEN ASSOCIATES
PO BOX 246
DRESDEN, ME 04342

Published twice a year, this directory lists and describes educational software for grades K-12, as well as administrative packages. Programs are included for the Apple II, Atari, PET, and TRS-80 and are indexed alphabetically. More than 180 software suppliers are listed.

SOURCES FOR COURSES
TALMIS
115 NORTH OAK PARK AVENUE
OAK PARK, IL 60301

Over 900 computer programs for kindergarten through college levels are listed in this annual directory. The software is indexed by title, topic, grade level, and publisher. Published software reviews are referenced.

THE SPECIAL WARE DIRECTORY
LINC RESOURCES, INC.
1875 MORSE ROAD
SUITE 215
COLUMBUS, OH 43229

This Directory lists companies manufacturing microcomputer software for special education. The information presented includes curriculum skill areas, educational levels, hardware compatibility, warranty and review policies, and instructional and testing applications.

1983 SWIFT'S DIRECTORY OF
EDUCATIONAL SOFTWARE
APPLE II EDITION
STERLING SWIFT PUBLISHING CO.
1600 FORTVIEW ROAD
AUSTIN, TX 78704

Descriptions of educational programs for the Apple microcomputer by subject and grade level are contained in this directory. The contents are divided into commercial and noncommercial publishers.

TRS-80 EDUCATIONAL SOFTWARE SOURCEBOOK
RADIO SHACK EDUCATIONAL DIVISION
400 TANDY ATRIUM
FORT WORTH, TX 76102

The TRS-80 Sourcebook lists all educational programs for TRS-80 microcomputers including many programs in the public domain. The Sourcebook is available from Radio Shack dealers.

PERIODICALS

A partial listing of the many hundreds of journals, magazines, and newsletters available to educators is provided. The listed periodicals were chosen because of their general content and intended audience.

CLOSING THE GAP
PO BOX 68
HENDERSON, MN 56044

Published bimonthly
Subscription -- $15.00

This newsletter explores the uses of computers (including peripherals and software) with the handicapped and special education students. Special modifications and applications for the deaf and hearing impaired, blind and visually impaired, mentally handicapped, learning disabled, and severely physically handicapped are also addressed. A special section on software news and reviews is included.

COMMUNICATION OUTLOOK
ARTIFICIAL LANGUAGE LABORATORY
COMPUTER SCIENCE DEPARTMENT
MICHIGAN STATE UNIVERSITY
EAST LANSING, MI 48824

Published quarterly
Subscription -- $12.00

This quarterly newsletter on electronic aids for the handicapped is a publication of the International Society for Augmentative and Alternative Communication, and is published jointly by the Artificial Language Laboratory and the Trace Research and Development Center at the University of Wisconsin.

THE COMPUTING TEACHER
DEPARTMENT OF COMPUTER &
INFORMATION SCIENCE
UNIVERSITY OF OREGON
1787 AGATE STREET
EUGENE, OR 97403

Published 9 times a year
Subscription -- $16.50

Published by the International Council for Computers in Education (ICCE), this journal is for people interested in the instructional use of computers. It emphasizes teaching about computers, computer applications, teacher education, and the impact of computers on curriculum.

COURSEWARE REPORT CARD
150 WEST CAROB STREET
COMPTON, CA 90220

Published 5 times a year
Subscription--$49.00

This review of educational microcomputer software is published in two editions: elementary and secondary. Each issue contains about 20 reviews which includes the Apple, Radio Shack, Atari, Commodore, and Texas Instruments.

CREATIVE COMPUTING
PO BOX 789-M
MORRISTOWN, NJ 07960

Published monthly
$2.50 per issue
Subscription--$24.97

Creative Computing includes numerous short articles about hardware and software for microcomputers. Focused primarily on the hobbyist or home user, this publication contains a great deal of technical information written for the novice. Reviews of software and new products are included.

EDUCATIONAL TECHNOLOGY
140 SYLVAN AVENUE
ENGLEWOOD CLIFFS, NJ 07632

Published monthly
Subscription--$49.00

This professional journal for educators covers all types of educational technology. Each issue includes software reviews as well as articles dealing with computer applications, research, and evaluation.

ELECTRONIC EDUCATION
ELECTRONIC COMMUNICATIONS, INC.
SUITE 220
1311 EXECUTIVE CENTER DRIVE
TALLAHASSEE, FL 32301

Published 8 times a year
$2.00 per issue
Subscription--$18.00

Nontechnical discussions of issues and news briefs on applications of educational technology are provided by Electronic Education. It also contains descriptive reviews of computer systems and instructional packages.

ELECTRONIC LEARNING
SCHOLASTIC, INC.
730 BROADWAY
NEW YORK, NY 10003

Published 8 times per year
Subscription--$19.00

Electronic Learning presents nontechnical introductions for elementary and high school teachers to the educational applications of microcomputers and other learning aids. The software review section provides reviews of commercial programs by both a classroom teacher and a content area specialist or school administrator.

INFOWORLD
375 COCHITUATE ROAD
FRAMINGHAM, MA 01701

Published weekly
Subscription--$31.00

Infoworld format includes analyses of computer hardware and software, news stories, and new developments in the microcomputer industry. It is aimed at the home, business, and educational user.

SCHOOL COURSEWARE JOURNAL
1341 BULLDOG LANE
SUITE C
FRESNO, CA 93710

Published 5 times a year on cassette or on diskette
Subscription--$65 and $80

This computerized magazine offers educational programs for Apple II, PET, and TRS-80, and Atari microcomputers on cassette and diskette. Each issue includes excellent support material, including a teacher manual and pupil worksheets. Programs concentrate on 10 pre-college curriculum areas.

SCHOOL MICROCOMPUTING BULLETIN
LEARNING PUBLICATIONS, INC.
303 BAY DRIVE NORTH
BRADENTON BEACH, FL 33510

Published bimonthly
Subscription--$28.00

School Microcomputing Bulletin consists of 24 four-page bulletins which describe and evaluate microcomputer developments, 12 monthly supplements of sources of materials, software evaluations, workshops, and special field reports by educators using microcomputers.

SCHOOL MICROWARE REVIEWS
DRESDEN ASSOCIATES
PO BOX 246
DRESDEN, ME 04342

Published twice a year
$20.00 per issue
Subscription--$35.00

School Microware presents fifty reviews and an index of reviews in other publications of microcomputer software. Each review includes an evaluation of content, instructional technique, and programming, as well as information about the topic, grade level, cost, and system requirements. Reviews are included for the Apple, Atari, PET, and TRS-80 microcomputers.

SOFTALK
11021 MAGNOLIA BOULEVARD
NORTH HOLLYWOOD, CA 91601

Published monthly
$2.50 per issue
Subscription--$24.00

Softalk lists software available for the Apple with brief reviews in a number of categories including education, word processing, data base management, and games. A regular column deals specifically with educational applications and new products. This publication is an excellent source of all types of information for Apple microcomputer users.

TEACHING, LEARNING, COMPUTING
SELDIN PUBLISHING, INC.
1061 SOUTH MELROSE
SUITE D
PLACENTIA, CA 92670-7180

Published 10 times per year
Subscription--$24.00

TLC is a new magazine geared toward classroom teachers who are interested in personal computing. Readers are kept up-to-date on developments in computer legislation, special education, administrative planning, and the academic disciplines. Each issue is planned to include current computer trends and predictions; indepth product reviews; computer management techniques; software test results and evaluations; and profiles of innovative educators.

WHOLE EARTH SOFTWARE REVIEW
PO BOX 27956
SAN DIEGO, CA 92128

Published quarterly
Subscription--
$18.00/yr.

This new software review magazine, available through subscription and on most newsstands, provides reviews of software for writing, analyzing, accounting, managing, telecommunications, drawing, learning, playing, programming, as well as other new or small categories.

VENDORS--COURSEWARE

Presented here is a list of software vendors who offer programs that may have application in special education instruction and instructional support.

ADDISON-WESLEY PUBLISHING COMPANY
SOFTWARE MARKETING
READING, MA 01867

Instructional support: Student activity fund accounting system, school equipment inventory system, annual school purchasing system.
System(s): TRS-80 Model I or III, Apple II

APPLIED EDUCATIONAL SYSTEMS
RFD #2, BOX 213
DUNBARTON, NH 03301

Instructional support: Grade reporting, district-wide education assessment, test scoring and scheduling, daily attendance accounting systems.
System(s): Apple, TRS-80, Commodore, IBM, Xerox

AQUARIUS PUBLISHERS, INC.
PO BOX 128
INDIAN ROCKS BEACH, FL 33535

Instruction: Survival skills, special needs.
System(s): Apple II, TRS-80

AVANT-GARDE CREATIONS
PO BOX 30160
EUGENE, OR 97403

Instruction: English, math, reading, science, music.
Instructional support: Audio-visual program, grading system, authoring system.
System(s): Apple II

COMPU-WARE
7 MECHANIC STREET
DOVER, NJ 07801

Instruction: Math, language arts, spelling, social studies, science, economic simulations, special needs.
Instructional support: Classroom management.
System(s): Apple, Atari, CP/M, TI, Sorcerer, TRS-80, PET

CONTROL DATA CORPORATION
SPECIAL EDUCATION INDIVIDUAL
EDUCATOR PROGRAM
8100 34th AVENUE SOUTH
MINNEAPOLIS, MN 55440

Instruction: Special needs.
Instructional support: IEP system.
System(s): Control Data 110

DEVELOPMENTAL LEARNING MATERIALS
ONE ELM PARK
PO BOX 4000
ALLEN, TX 75002

Instruction: Math, special needs.
System(s): Apple II plus

EDUCATIONAL ACTIVITIES, INC.
PO BOX 392
FREEPORT, NY 11520

Instruction: Reading, language arts, math, social studies, science, physical education, special needs.
Instructional support: Classroom management.
System(s): Apple II Plus, TRS-80, PET, Atari

EDUCATIONAL SOFTWARE
PO BOX 746
MCMINNVILLE, OR 97128

Instruction: Language arts, math, science, social studies.
Instructional support: Programs for teaching computer languages, class management.
System(s): Apple, Atari, PET, TRS-80

EVANS NEWTON, INC.
7745 EAST REDFIELD ROAD
SCOTTSDALE, AZ 85260

Instructional support: Curriculum-attendance-IEP-test management, teacher information and record keeping.
System(s): Apple, Commodore, IBM, TRS, other micros using advanced optical scanning.

HAMMETT/MICROCOMPUTER DIVISION
HAMMETT PLACE
BOX 545
BRAINTREE, MA 02184

Instruction: Computer literacy, foreign languages, language arts, logic, science, social studies, special needs.
Instructional support: Word processing, classroom management, budgeting, authoring system, inventory control.
System(s): TRS-80, CBM/PET, Apple

K-12 MICROMEDIA
PO BOX 561
VALLEY COTTAGE, NY 10989

Instruction: Math, language arts, reading/vocabulary, science, computer literacy, business education, early childhood, social studies.
Instructional support: School management programs, educational games.
System(s): PET, TRS-80, Apple II

LAUREATE LEARNING SYSTEMS, INC.
1 MILL STREET
BURLINGTON, VT 05401

Instruction: Special needs.
Instructional support: Microcomputer language assessment and development system.
System(s): Apple II Plus

LEARNING TOOLS, INC.
686 MASSACHUSETTS AVENUE
CAMBRIDGE, MA 02139

Instruction: Special needs, vocational.
Instructional support: Curriculum management, teacher planning.
System(s): Apple II & III, IBM, Xerox, TRS-80

MICRO SCHOOL PROGRAMS,
BERTAMAX, INC.
101 NICKERSON STREET, SUITE 202
SEATTLE, WA 98109

Instruction: Math, language arts.
Instructional support: Instructional management system, reading level analysis, gradekeeper, school attendance, career information system.
System(s): Apple II, Atari, TRS-80

MICROCOMPUTER EDUCATIONAL PROGRAMS (MCE)
157 S. KALAMAZOO MALL
KALAMAZOO, MI 49007

Instruction: Special needs, vocational education, home economics, functional mathematics, consumer education.
System(s): Apple II

OPPORTUNITIES FOR LEARNING, INC.
8950 LURLINE AVENUE, DEPT. L3
CHATSWORTH, CA 91311

Instruction: Math, science, library science, social studies, language arts, foreign language, business education, survival skills, music, art, special needs.
Instructional support: School business management programs.
System(s): Apple, TRS-80, PET, Atari

SOUTHERN MICRO SYSTEMS FOR EDUCATORS
PO BOX 1981
BURLINGTON, NC 27215

Instruction: Special needs.
Instructional support: WISCR, WAIS-R, IEP for the learning disabled.
System(s): Apple II Plus, IBM

SYSDATA INTERNATIONAL, INC.
7671 OLD CENTRAL AVENUE, NE
MINNEAPOLIS, MN 55432

Instruction: Special needs, math, computer literacy.
Instructional support: School information management, Woodcock-Johnson, school census.
System(s): Apple II

TOTAL DATA SYSTEMS
PO BOX 547
RAYMORE, MO 64083

Instructional support: IEP, student scheduling, grade reporting, student database, accounting.
System(s): CP/M

UNICOM
A DIVISION OF UNITED CAMERA
297 ELMWOOD AVENUE
PROVIDENCE, RI 02907

Instruction: Language/reading development.
Instructional support: Grade reporting, school inventory.
System(s): Apple II

ENCYCLOPEDIA BRITANNICA EDUCATIONAL CORP.
425 NORTH MICHIGAN AVENUE
CHICAGO, IL 60611

Instruction: Language arts, science, math, special needs.
System(s): Apple II Plus

This *Guide* is not intended to be a compilation of all the software products available to education. Space simply prohibits such a collection from inclusion in ***EE***. All prices listed are suggested retail prices and are subject to change without notice. Check with local distributors for educational discounts.

It is against the law to copy or reproduce any original work—whether diskette, cassette or printed material—without prior written permission of the copyright owner. Any person or institution making such copies is subject to prosecution. All programs in this *Buyer's Guide* are protected by copyright law.

SOFTWARE *Buyer's Guide*

PART I

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Trademarks: Ace is a registered trademark of Franklin Computer Corporation. Albert is a registered trademark of Albert Computer, Inc. Apple is a registered trademark of Apple Computer Company, Inc. Atari is a registered trademark of Atari, Inc. Bell & Howell is a registered trademark of Bell & Howell. CBM is a registered trademark of Commodore Business Machines, Inc. Commodore 4032 is a registered trademark of Commodore Business Machines, Inc. Commodore 8032 is a registered trademark of Commodore Business Machines, Inc. Compaq Portable Computer is a registered trademark of Compaq Computer Corporation. IBM is a registered trademark of International Business Machines Corporation. MC 6800 is a registered trademark of Motorola, Inc. NCS Sentry Plus is a registered trademark of National Computer Systems, Inc. OC8820 is a registered trademark of Monroe Systems for Business. Panasonic is a registered trademark of Panasonic Industrial Company. PC is a registered trademark of International Business Machines Corporation. PET is a registered trademark of Commodore Business Machines, Inc. TI-99/4A is a registered trademark of Texas Instruments. TRS-80 is a registered trademark of Radio Shack division of Tandy Corporation. VCS-2600 is a registered trademark of Atari, Inc. Votrax Educational Computer is a registered trademark of Computalker Industries, Inc. VIC-20 is a registered trademark of Commodore Business Machines, Inc. Victor 6000 Strike is a registered trademark of Victor Business subsidiary of Kidde, Inc.

BEST COPY AVAILABLE

ADMINISTRATIVE AIDS

Absentee Recording System, $99.95
Apple DOS 3.2.
Helps school administrators keep track of up to 1,725 students. Menu-driven. Stores student's name, I.D. number, sex, address, phone number, courses and teachers. Also sets up school year calendar. **Single Source Software.**

Administrative Absentee Program, $50
TRS-80 I, 16K, Level II cassette or diskette.
Lists daily absentees for both students and faculty. User friendly. Available for elementary, junior and senior high school levels. **Educational Software Consultants, Inc.**

The Assistant Principal, $188.95
Apple II Plus, 48K.
Affords small to mid-sized schools a system for keeping and updating student records. Hard copy printouts can be generated alphabetically by class, grade level, entire school or student's birthdate. **Learning Systems, Ltd.**

Automated Accounting for the Microcomputer, $37.50
Apple Models II, II Plus and IIe, DOS 3.2 and 3.3, 32K, Commodore 4032, 32K, Monroe OC8620, 32K, TRS-80 Models I, III and IV, 32K.
Covers accounting practices for grades 10-12 including accounts payable and receivable, general ledger and payroll. Requires some familiarity with manual accounting practices, but no knowledge of computers. **South-Western Publishing Company.**

CCA Data Management System VS 4.1.1, $99.50
Atari Models 800 and 1200, 40K minimum, disk drive and printer.
Complete data filing and organization system. Defines, enters, sorts and reports information. Not copyguarded. **C. E. Software.**

Class Scheduling Program, $349.95
Apple with Applesoft, 48K, 2 disk drives and 80 column printer.
Allows schools with up to 2,400 students and up to 999 courses and sections to analyze master schedules and prepare individual schedules. Allows for automatic entry of required courses and fast entry of any optional request and alternates. **CMA Microcomputers.**

Cus/Staff, $245
Apple II Plus, 48K, disk drive, B&W monitor.
Provides school officials with a tool to calculate the number of custodians needed. Consists of multi-media materials, including a manual and audiotape. **MASBO Cooperative Corporation.**

Educational Management Series I and II, $425
Apple II Plus, 48K, 2 disk drives and 132 column printer.
Composed of two modules including complete school inventory control and grade reporting. **Unicom.**

Employ-Ease Human Resource Software, $1,500-$6,500
NCS Sentry Plus including NCS Sentry 3000 Scanner and IBM PC.
Administers and scores tests and surveys on scannable forms. Information processing modules include employment selection, employee data, government compliance and administrative data. **National Computer Systems.**

ESIS-100: An Administrative Program for Schools, $1,795
Apple Models II and IIe, 64K; IBM PC, 64K; TRS-80 III, 48K; 2 disk drives, reader option available.
An integrated data base system that allows a school to expedite student scheduling, daily attendance recording and reporting and to keep up-to-date and highly accessible student records. **Educational Software & Marketing Company.**

Expense Trac, $495
IBM PC; TRS-80 III; other CP/M microcomputers, 80 column printer.
Automates fund accounting procedures of school administration, small profit and non-profit organizations and departmentalized budgeting for divisions of larger companies. Structured to provide control information on expenditures in relation to budget targets. **Output, Inc.**

General Ledger and Financial Reporter Fact Sheet, $595
IBM PC, Compaq Portable Computer; 2 disk drives or IBM PC/DOS compatible hard disk, minimum 64K RAM.
Features user customization of financial statements in which user can extract financial data from the general ledger and can produce unlimited variety of reports. Maintains 12 months of previous year balances by account for comparative reports and more. **Information Unlimited Software.**

HEI-School Attendance, $789.87
Apple Models II and IIe, Apple serial interface board, 2 disk drives, DOS 3.3, 80 column printer, HEI card reader, 121-4 model 3.
Provides a means for recording and reporting both daily and term student attendance information. Enters pre-formated cards into the reader by category. Categories include absent, tardy, cut, field trip and authorized to leave building. **HEI, Inc.**

Listmaker, $87.50
Apple Models II and II Plus; TRS-80 Models I and III, 48K, disk drive.
Information and management package used for student lists, customer records, real estate listings and membership roster—range of direct mail applications from labels to personalized form letters. **Reader's Digest Services, Inc.**

Magic Memory, $99.95
Apple Models II and IIe, Albert; Franklin.
Data base address book system. Simulates a standard address book, yet contains advanced features to add, edit, move and print information. It will print labels, lists and an entire address book complete with index tabs. **Artsci, Inc.**

64 Mailing List, $34.95
Commodore 64.
Holds 250 names and addresses per file, features full screen editing for adding, deleting or changing addresses. It has full sort capabilities and can print or review individual entries, sorted versions or the entire file. **Computer Marketing Services, Inc.**

Mail/Phone List, $14.95
Apple II, 48K.
Allows you to enter and store name, address and phone data for friends or businesses. Information may be changed, deleted, sorted and printed on the screen or on mailing labels. **Compu-Tations, Inc.**

Microbiz, $140
Apple Models II Plus and IIe; Atari 800; C.B.M. DOS 2.0 (4040 or 8050 drives); TRS-80 Models I, II and III; IBM PC, and other microcomputers operating under CP/M.
Consists of six independent accounting programs which teach the fundamentals of accounting, bookkeeping and the interaction between debits and credits and other essentials. **Compumax.**

Order Entry Fact Sheet, $595
Compaq Portable Computer; IBM PC; 2 disk drives or PC/DOS compatible hard disk, minimum 64K RAM.
Generates order confirmations and calculates prices for up to five discount categories and tax jurisdictions. Includes five tax tables allowing rates for multiple locations and special taxes on specific products. Also maintains backorder status. **Information Unlimited Software.**

PFS:File, $125-$175
Apple Models II, IIe and III; IBM PC or equivalent; TI Professional Computer.
Records, files, retrieves and summarizes information organized on forms designed on the computer screen. **Software Publishing Corporation.**

PFS:Report, $125
Apple Models II, IIe and III; IBM PC, TI Professional Computer, 2 disk drives, printer, PFS:File.
Sorts, calculates, formats and prints presentation quality reports from the information in files created with PFS:File. It prints 9-20 columns per report including three calculated columns. Totals, subtotals, averages, subaverages, counts and subcounts can be printed on every column. Has comprehensive sorting capabilities plus automatic page numbering, title printing and centering. **Software Publishing Corporation.**

Project Sorts, $245
Apple II; Franklin Ace, 2 disk drives, video monitor and most printers.
Individual addresses, telephone numbers, birth date, entry date, etc., are part of the standard file. Information can be organized into 10 major categories which can be divided into 12 subcategories for a total of 120 different sorting variables. **Evans Newton, Inc.**

Scheduling Program, $2,500
Apple; Atari; Commodore; Franklin; Radio Shack, minimum 32K, 80 column screen, hard disk drive and printer.
Handles annual, semester, tri-master, and/or quarterly classes. Prints a conflict matrix, students' schedules, periods offered and class rosters. Generates a master schedule. Students' schedules have provisions for book fees, workbook fees and lab fees. **C.E.R.F., Inc.**

The School Attendance System, $3,250
Apple Models II Plus and IIe.
Designed to keep and report attendance on a school-wide basis. It contains full on-line creating, editing and deleting of student and class records. Written in UCSD Pascal. **Educational Administration Data Systems.**

School Inventory, $39
Apple, 48K, 3.3 DOS, 2 disk drives.
Keeps track of inventory for up to 1,000 items. It will alter, update, erase and print reports. **Educational Courseware.**

School Payroll System, $500
CP/M in BASIC 2, dual 320KB/disk drive microcomputer, standard 132 character wide printer.
Handles 99 deductions, TSA's retirement systems, auto, sick/vacation pay and payroll checks and numerous reports that are easy to read. **School Management Systems.**

School Records, $149
Apple II, 2 disk drives.
Includes storage, sorting and printout for students' names, addresses, emergency information, bus routes, homerooms and lunch schedules. Stores information on up to 1,000 students. **Educational Computing Systems.**

The School System Micro-Scheduler, $2,350
IBM PC, MSDOS/PCDOS Operating System, 256K RAM, 2 disk drives, 132 column printer, 80 column video screen.
The general features include scheduling by course numbers of up to eight alphanumeric characters, schedules for up to four semesters and schedules for any type of time table. Handles up to 32 periods per day, eight days per cycle and global alternatives as well as individual student alternates. **Columbia Computing Services.**

Student Record / Attendance / Report Card Program, $2,500
Apple; Atari; Commodore; Franklin, Radio Shack; minimum 32K, 80 column screen, hard disk drive and printer.
Figures attendance period-by-period or cumulatively, sorts students by virtually anything on record, generates class rosters, reports, report cards, letters, perfect attendance and deficiency notices. **C.E.R.F., Inc.**

Tallymaster, $79.95-$129.95
IBM PC; TRS-80 Models I and III, LOBO MAX 80, LNW and other TRS-80 compatibles.
Summarizes and analyzes budgets and expenses. Contains up to 702 defined categories. Numbers can be added to any category in any order with new totals shown instantly. An on-line HELP file is included. **Prosoft.**

BASIC SKILLS AND TEST PREPARATION

College Board 1983 SAT Exam Preparation Series, $299.95
Apple; Atari; Commodore; Franklin, IBM PC, TRS-80.
Includes 42 programs covering vocabulary, reading comprehension, word relationships, mathematics and tests of standard written English. **Krell.**

College Entrance Examination Preparation: Part I—The Verbal Series, $575
Apple Models II and IIe, 48K RAM, with Applesoft BASIC, disk drive, 3.3 DOS, video display.
A five disk series which is designed to provide individualized training in test-taking strategies and skill areas for the SAT and other similar college entrance exams. Adjustable time frame. **Borg-Warner Educational Systems.**

College Entrance Examination Preparation: Part II—The Verbal Strategies/ Mathematics Series, $575
Apple Models II and IIe, 48K RAM, with Applesoft BASIC, disk drive, 3.3 DOS, video display.
A seven disk series which is designed to provide individualized training in test-taking strategies and skill areas for the SAT and other similar college entrance exams. Understanding developed through explanations of answers and distractors. Adjustable time frame. **Borg-Warner Educational Systems.**

Computer SAT Test Preparation Kit, $483.75
Apple; Atari 800; Commodore 64; IBM PC; TRS-80; 48K.
Combines a comprehensive textbook with a computer program. A detailed user's manual, educator's manual and student record booklets supplement the program. **Coronado Publishers, Inc.**

Dial-a-Drill Home Learning System, $18 per month/per course
Minicomputer-based, CCC-17 Instructional System; Digital Speech System.
Delivers low-cost computer-assisted instruction to students over home touch-tone telephones. Designed to improve students' basic skills by offering supplemental coursework in mental arithmetic, reading and spelling with 8-10 minute sessions in which student controls pace. **Computer Curriculum Corporation.**

English Achievement Series I-V, $39.95 each; $175/set of five diskettes
Apple, 48K, disk drive; IBM PC; Commodore Models PET 16K and CBM 64 cassette or diskette; TRS-80, 32K, disk drive.
Five program package contains data base of sentences presented in the four formats used on the English CEEB Exam. The program provides explanations, error analyses and approximate English achievement scores. **Microcomputer Workshops.**

English SAT I, $30
Apple Models II and IIe, disk drive.
Tutorial for verbal portion of the SAT. Multiple sections of 25 multiple choice questions on antonyms, analogies, sentence completion, grammar and reading comprehension. Instruction mode gives explanations for all answers. **Micro Labs.**

GED-100, $1,275
TRS-80 III, 48K, 2 disk drives.
Provides diagnosis, remediation, reinforcement, testing and individual prescriptions for basic materials in order to prepare students for the GED test. **Educational Software & Marketing Company.**

How To Read In the Content Areas CP/DK Read, $49 each; $189/set
Apple; Atari 800; Commodore Models 64 and PET; TRS-80; 48K, cassette or diskette.
Twenty programs in the areas of science, social studies, literature and mathematics. Concepts include: detecting, spotlighting, recalling and surveying. **Educational Activities, Inc.**

Knowledge Master Series, $27 per diskette
Apple Models II Plus, IIe and III; Franklin, 48K, disk drive.
Consists of 46 disks, each containing 400 questions covering hundreds of topics in areas such as earth science, physical science, math, literature, English and mythology. **Academic Hallmarks.**

Memorease, $79.95-$99.95
Apple; Atari Models 400 and 800; Commodore 64; IBM PC; TRS-80.
Using a technique from cognitive psychology, "gradual recall," data is memorized easily and becomes available to the user for long term retention and recall. Contains multiple modes for training and an editing feature. **Inel Corporation.**

Psi Reading, $99.95
Apple Models II, II Plus and IIe; Franklin Ace 1000 and 1200; 48K RAM, disk drive.
Tests a child's ability on one of 200 objectives, then teaches only what the child doesn't know. It also manages the teacher's records, student records, class records or a grouping report by objective. **Universal Systems for Education, Inc.**

Plato Basic Skills Series, $49.95
TI 99/4A.
Designed for children who need challenges or additional learning materials in coursework generally presented in grades three through eight. Three packages include math, reading and grammar. **Texas Instruments.**

Preparing for the SAT, $99.95-$119.95
Apple Models II, II Plus and IIe, 48K; Atari Models 400 and 800, 16K cassette; 24K diskette.
Teaches how to take the SAT and other aptitude tests. Includes six programs: Analogies, Number Series, Quantitative Comparisons and Vocabulary 1 & 2. Also contains unit on time strategy. **Program Design, Inc.**

Preparing for the SAT, $16.95 cassette; $23.95 diskette; six programs $125 cassette, $139.95 diskette
Atari, 16K.
Teaches students how to take the SAT, develop problem solving skills and answer questions typically found on such tests. K-12. **Micromedia.**

Prep-100, $495
TRS-80 III, 48K, 2 disk drives.
For students planning on taking the ACT Assessment Examination. The program provides diagnosis, remediation, reinforcement, testing and prescriptions to aid students in preparing for the actual test. **Educational Software & Marketing Company.**

Preschool IQ Builder 2, $16.95-$23.95
Apple II, 32K; Atari, 16K and 24K w/ joystick.
Designed for ages three through six, the program's two parts teach letters, symbols, numbers and word discrimination by having the user decide whether pairs of figures are the same or different. **Program Design, Inc.**

PSAT and SAT Word Attack Skills, $49
Apple Models II and II Plus, 48K, DOS 3.3.
Includes two software tutorials which prepare college-bound students for the antonyms portion of the SAT. Timed tests are included. **Edu-Ware.**

Run, Robot, Run, $59.95
Apple II, 48K.
Specifically created for early childhood education and written by educators, it includes numerals and numbers, counting skills, social skills, letters of the alphabet, memory games and more of the basic skills young children need. **Educational Teaching Aids.**

Schoolhouse, $24.95
Apple II, 48K.
A collection of 10 programs on one disk, covering topics such as spelling, language arts, Roman numerals, fractions and algebra. **Compu-Tations, Inc.**

Spanish Achievement I, $49.95
Apple, 48K, disk drive.
Provides practice in one vocabulary format of the French Achievement Examination from a bank of over 150 problems. From a choice of four options, the student must select the appropriate word omitted. Students receive an English translation of the sentence and an explanation of each option plus achievement score and a dictionary of missed words. **Microcomputer Workshops.**

Special Skill Builders I, $29.95
Apple II, 48K.
For use in special education situations or for the handicapped, it requires limited keyboard skills and the speed of the presentation may be adjusted through a password protected management file. Game paddles may also be used to respond to screen presentations. **Compu-Tations, Inc.**

State Assessment Preparation, $100/grade level
TRS-80 III, 48K, disk drives, cassette or diskette.
An extensive set of programs to prepare students for the State Assessment tests. Composed of special reading, vocabulary drills and vocabulary testing, it includes 70 to 100 programs per grade level including the third, fifth, eighth and eleventh grades. **Educational Software Consultants.**

Thinking Skills, $49
TRS-80 Models I and III, 16K cassette or 32K diskette.
Four programs sharpen thinking skills with concepts and rules of classification and categorization, number and letter patterns. **Sunburst Communications.**

The Young Folks Series, $80-$100
Apple II Plus; Commodore PET.
Contains a series of four programs which teach young learners concepts such as in, out, on, off, over, under, full, empty and different. It processes words which frequently cause reversal problems and contains letter matching games. **Island Software.**

COMPUTER LITERACY AND PROGRAMMING

Alphabet/Keyboard, $24-$34.50
Apple II, Applesoft 48K, 3.3 DOS; TRS-80 Model I and III, 16K cassette, TRS-80 Model III, 48K diskette.
Teaches young students to type letters in alphabetical order. Provides good introduction to the computer keyboard. Note: No attempt is made to teach finger positions or other typing skills. **Random House, Inc.**

The Amazing Ben, $79.95
Apple; Atari; Commodore; Franklin, TRS-80; IBM PC.
Introduces programmers of all ages to artificial intelligence. It teaches Ben's language and guides the user in writing increasingly difficult programs. **Krell.**

The Apple's Core, $49.95
Apple Models II Plus and IIe, 48K, disk drive.
An introduction to Applesoft computer programming for the beginner. Teaches how to use and program the Apple. **The Professor.**

Basic Teach, $70
IBM PC.
A tutorial on the BASIC programming language in which the user learns to use BASIC commands and applies the fundamentals learned to a series of practical applications. **Reston Publishing Company.**

Basic Tutor Series, $295
Apple 48K, 3.3 DOS.
A nine-disk series that provides a guided tour into the world of Applesoft programming. Introduces system commands through writing programs with sound and graphics. **Educational Courseware.**

Basic Tutor 3 Graphics Commands, $39
Apple 48K, 3.3 DOS.
Introduces and explains how to create low and high resolution graphics. **Educational Courseware.**

BLT, $12.95-$14.95
Commodore Models 64 and PET 16K, available on cassette or diskette.
Introduces the simplest programming concepts and commands including RUN, LIST, PRINT, FOR-NEXT, IF-THEN, GO-TO, END and REM. An evaluation of student comprehension is included. **Micrograms, Inc.**

The Calc Tutor, $99.95
Major CPM-based hardware.
A tutorial designed to expedite the task of learning the versatile electronic worksheet program "SuperCalc." **Classroom Consortia Media.**

Computer Awareness, $74
Apple Models II Plus, IIe and II with Applesoft ROM card, disk drive, one color, B&W or green monitor, 48K.
Hands-on practice to computer literacy covering "What Computers Do," "How Computers Work," "Everyday Computers" and "Introduction to Programming." **Society for Visual Education, Inc.**

Computer Concepts, $45
Apple II Plus, Atari 800, TI 99/4A.
Introduces high school and college students, teachers and other adults to basic computer concepts, including the keyboard, storage and memory files, editing and databases. **Plato Educational Courseware-Microcomputer.**

Computer Literacy: Adventures of the Lollipop Dragon, $255
Apple II Plus, 48K.
Teaches where and how computers are used. Provides hands-on activity with games and colorful animated graphics to teach letter and number key locations. Introduces special function keys, how to manipulate the flashing cursor and plotting points. **Society for Visual Education, Inc.**

Computer Literacy: An Introductory Course, $119
Apple Models II and IIe, Atari 800, IBM PC, TI 99/4A, TRS-80 Model III and Color Computer.
Consists of 15, 45-minute lessons. Includes a teacher's manual, 15 student workbooks, 15 transparencies, eight wall posters and five copies of two sample programs on diskette or cassette. Designed for people with no computer experience. Uses a hands-on approach. **Continental Press, Inc.**

Computer Literacy: Introduction, $45
Apple II Plus, Atari 800, TI 99/A.
Gives junior and senior high school students a basic understanding of computers and how they are used in business, industry and society. It gives a brief introduction to the history, uses and issues surrounding computers and is the foundation for a full curriculum in computer literacy and programming. **Plato Educational Courseware-Microcomputer.**

Concurrent Programming Package, $2,000
Motorola MC 68000 based computer; Pascal 2 compiler on host system.
Gives the user the ability to write concurrent programs in standard Pascal and to develop embedded systems containing those programs. Using Pascal primitives and the stand-alone support library, users can write and control real-time processes and device drivers in Pascal. **Oregon Software.**

Co-Pilot, $36
Apple Models II and II Plus, 64K RAM; or 48 w/language card.
A complete self-contained, self-paced interactive tutorial which teaches how to program in Apple Pilot. **Apple Computer, Inc.**

The CyberLogo Turtle, $99.95
Apple Models II and III, 48K.
An open-ended computer literacy learning environment that allows students to move the CyberLogo Turtle and draw pictures by pressing single keys. Offers an on-line HELP feature and a complete description of the language. It also includes a STEP mode for easy debugging. **Cybertronics International, Inc.**

Data Entry Activities for the Microcomputer, $59.50
Apple II Plus, DOS 3.2, 32K; Apple Models II Plus and IIe, DOS 3.3, 32K, TRS-80 Models I, III and IV, 32K.
Develops accuracy and dexterity in keyboard characters and numerals. Students work through 10 business activities and receive feedback relating to the percentage of errors made in entering the information and the words-per-minute. **South-Western Publishing Company.**

Discover Basic: Problem Solving with the Apple II, $74.95
Apple Models II Plus and IIe, 32K, DOS 3.3.
An introduction to programming and problem solving that promotes personal hand-and-mind involvement. Stresses a step-by-step approach to problem solving. **Sterling Swift.**

Edubas I, $95
IBM PC, 64K, disk drive, DOS, BASIC, color/graphic adapter, 80 column B&W or color screen.
Teaches how to program the IBM PC with the BASIC language. Includes 13 lessons with analogies, examples and exercises. Designed for beginners. **Europro, Inc.**

Edubas II, $105
IBM PC, 64K, disk drive, DOS, BASIC, color/graphic adapter, 80 column B&W or color screen.
Unlocks the advanced functions of the BASIC language of the IBM PC such as string manipulations, file manipulations and graphics. **Europro, Inc.**

Faster, $29.95
TRS-80 Models I and III, disk or tape.
A machine language utility that speeds up most TRS-80 BASIC programs by 20-50%. No hardware changes are involved. Analyzes BASIC programs while they run, then displays a simple change that sequences variables so that the ROM will run faster. Works on purchased software and handles programs too large to be compiled. **Prosoft.**

Filebase, $75
Microcomputer with Z80, 8080, 8085 Microprocessor, CP/M 2.2, 64K RAM, disk drive.
Menu- and prompt-driven package that processes files of records comprised of comma-delimited fields. Options include record selection, merging, sorting, creating new files and appending existing files. **EWDP Software, Inc.**

How To Program in the BASIC Language, $89
Apple Models II Plus and IIe, 32K; Atari 800, 32K; TI 99/4A; TRS-80, 32K.
Teaches step-by-step BASIC programming. No programming background required. **Sterling Swift.**

IBM Personal Computer Filecommand, $35
IBM PC.
A file directory listing that provides a fast and easy way to issue DOS commands, manage files and execute programs. **IBM.**

Introductory Logo Activity Packet, $18
TI 99/4A.
Consists of methods and materials needed for setting up a classroom computer area as well as games, reproducible activity cards and detailed lessons for teaching TI Logo. **Computer Ed.**

J-Format, $60
PC DOS 1.10, 128K.
A utility program which includes an electronic disk of up to two meg; when used with JRAM, a background print spooler of up to two meg; with JRAM, 10 sector formatting, capacity to read, write and format disks or quad drives, high speed file transfer program and hard disk support. **Tall Tree Systems.**

The Karel Simulator, $85
Apple II w/language card and disk drive.
Implements a Pascal-like compiler/debugger environment in which to learn and explore programming. Allows users to write programs that instruct a robot to perform certain tasks. **Cybertronics International, Inc.**

Keyboard, $30
Apple II, 3.3 DOS; Atari Model 400 and 800, 32K; TRS-80 III, 32K.
Containing both sound and graphics, it acquaints the user with the keyboard location of numbers, letters and special characters through a facsimile of the keyboard which appears on the screen. **Teacher Support Software.**

Know Your Apple, $34.95
Apple II Plus, 48K.
Tells the story of the Apple with music, voice and animated examples. Packaged in a gift box replica of the Apple computer. **MUSE.**

Know Your Apple IIe, $24.95
Apple IIe, 48K.
Introduces the new Apple IIe computer. Includes step-by-step lessons on how the computer, disk drive, printer and monitor work. Packaged in a gift box replica of the Apple computer. **MUSE.**

The Last One, $395-$600
Apple II Plus, 48K, CP/M 64K, IBM PC 64K, TRS-80 III 64K, CP/M-86 for Victor 9000/Sirius 64K; two disk drives.
A program code generator that allows your program design (in flow-chart type statements) to be entered in an easy-to-use menu style. It produces error free BASIC code. Any program produced is independent with no royalty or license fees to pay. **Krown Computing.**

Link Sampler, $60
Apple Models II and III.
Designed to make learning the Pascal language easy and fast. It includes 21 teaching programs that mix some simple business routines with easy mathematics and a few games. **Link Systems.**

MagiCalc, $149.95
Apple Models II and IIe; Franklin, Albert; 48K minimum; DOS 3.3.
A second generation spread sheet that will automatically use most 80 column displays and will access up to 512K of add-on memory. A 70 column software display is included. Features include individual column widths, automatic pagination and cell attributes. **Artaci, Inc.**

The Master Memory Tutorial Map, $29.95
Atari Models 400 and 800, 16K tape, 32K disk.
Covers over 30 memory locations in the Atari. Professor Van Chip and Proto narrate their way through flashing displays, disappearing cursors, inverse video screens and dozens of other effects. **Educational Software, Inc.**

MasterType, $39.95
Apple Models II and IIe; Atari Models 400 and 800; 32K, disk drive.
Presents the action of space invader games on a full color screen combined with a series of 17 progressive lessons to teach students touch typing skills. Prints hard copy results of each lesson. **Lightning Software.**

Meet the Computer: Beginning BASIC, $29
Apple with Applesoft BASIC, 32K, 3.3 DOS, Atari Models 400 and 800 with Atari BASIC, 16K; Commodore PET with 2.0, 3.0 or 4.0 BASIC, 8K; TRS-80 Models I and III, 16K, IBM PC.
Fifteen color-coded activity folders teach beginning BASIC programming, statements and commands. Includes reference folders, reproducible graphs and charts, programmers guide and other activities. **Sunburst Communications.**

Meet the Computer: Intermediate BASIC, $35
Apple with Applesoft BASIC, 32K, 3.3 DOS, Commodore PET with 2.0, 3.0 or 4.0 BASIC, 8K; TRS-80 Models I and III, 16K.
Introduces students to a variety of intermediate BASIC functions, commands and statements. Concepts include random numbers, special functions, arrays, varying input forms and graphics. **Sunburst Communications.**

Micros Made Easy, $150
Apple Models II with Applesoft and Apple II Plus with 48K RAM, disk drive, DOS 3.3.
An introduction to microcomputers for the absolute beginner. Prepares the learner to use a microcomputer with ease. The user sets the pace and can go back as often as necessary. **Science Research Associates, Inc.**

New Step by Step, $89.95
Apple Models II, II Plus and IIe, 48K.
Teaches how to program the Apple in BASIC at user's own speed. It includes computer graphics, animation, sound effects and a voice track. Includes two diskettes, four audio cassettes and a workbook. **Program Design, Inc.**

No Frills Logo, $99
Apple II; Franklin.
The MIT copyrighted version of Logo, it also includes the MIT application programs *Dynatrack, Rocket, Animals, The Sound Editor, The Shape* and *The Logo Assembler*. **Krell.**

PC Logo, $199.95
IBM PC, 64K expandable to 128K.
Incorporates the best features of Logo for the Apple computer and will also utilize distinctive features available on the IBM PC. **Harvard Associates, Inc.**

Quick Compress, $19.95
TRS-80 Models I and III, disk or tape.
Removes the blanks and remarks from even the largest BASIC program in less than three seconds. Takes only 276 bytes of memory, and produces small, fast programs without altering their logic. **Prosoft.**

Snail, $25.90-$29.90
Commodore Models 64 and PET, 16K, cassette or diskette.
Students experiment with entering directions that control the movement of a snail on the screen. Advanced levels allow the students to be more creative as they teach the snail to execute patterns of movement. A teachers guide is included. **Microgrems, Inc.**

Sorting Techniques I, $24.95
Apple 48K, disk drive.
An excellent resource for the computer science teacher in conjunction with a course in programming or an AP course in computer science. Contains five sorting routines. Each sort is shown graphically using 10 large block letters picked randomly. The user may show the sort one step at a time by pressing the space bar. **Microcomputer Workshops.**

Step by Step 2, $489.95
Apple Models II, IIe and II Plus, 48K.
Covers intermediate BASIC programming, machine language and high resolution graphics. Consists of two diskettes, four audio cassettes and a workbook. **Program Design, Inc.**

Structured Basic, $59.50
Apple Models II Plus and IIe, DOS 3.3, 32K; IBM PC; TRS-80 Models III and IV, 32K.
Presents the entire BASIC language in an easy-to-understand style. Each chapter contains four programming assignments with varying degrees of difficulty. Requires no prior programming knowledge. **South-Western Publishing Company.**

SuperDrive, $45
IBM PC with PC DOS, disk drive.
Enhances the processing speed of your IBM PC. Can assign RAM memory space for use of up to four SuperDrive electronic disk drives and retrieve data at "RAM speeds." **AST Research, Inc.**

Supersoft C, $275-$500
CP/M-80; CP/M-86, MS DOS (IBM PC DOS).
A multi-pass compiler which produces highly optimized code, making it possible to avoid assembly language coding for most tasks. **Supersoft.**

SUPERSPOOL, $45
IBM PC with PC DOS, printer.
Provides buffered output of print data to a parallel or serial printer while permitting concurrent processing of other programs. SUPERSPOOL operates in the "background" and frees the operating system for other tasks, such as execution of another program. **AST Research, Inc.**

Terrapin Logo Language for the Apple II, $149.95
Apple Models II, II Plus and IIe; Franklin Ace 1000, 64K RAM, disk drive.
Beginners as young as pre-schoolers learn structured thinking through Turtle Graphics. More advanced programmers can use features such as list-processing, interactively-defined procedures and local variables. **Terrapin, Inc.**

Torricelli Scribe, $150
Any CP/M 2.2 system; MS DOS (IBM PC DOS 2.0) 48K minimum, printer optional.
A utility program for the export-import of courseware allowing it to be spell-checked and the number of alloted pages changed. **The Answer in Computers.**

Turtle Graphics II, $89.95
Commodore 64.
Introduces an easy-to-learn computer language and lets the first time user try programming. Gives user an expanded set of graphic capabilities but is used in the same way as the Turtle Graphics program. **Bohle Company.**

Turtle Tracks, $30-$40
Apple II, 48K; Atari Models 400 and 800, 24K; Commodore Models 64, VIC 20 and PET 8K or 16K expanded; TI 99/4A, 32K extended BASIC.
A mini-programming language that uses Turtle Graphics to help children and adults understand notions of computer programming. **Kidstuff.**

Type Right, $29.95
Commodore PET.
A complete course of 22 typing programs including easy directions for the beginner, hundreds of real words and five typing games. **Barron Enterprises.**

Typing Strategy, $24.95-$34.95
Apple II; Commodore Models 64 and VIC 20; IBM PC.
Uses an animated image of the keyboard and a pair of hands to teach the strategy exhibited by master typists and keyboard operators. **Behavioral Engineering.**

Typing Teacher, $14.95
Apple II, Atari 800, 48K.
Utilizes behavioral learning principles to teach anyone to master the typewriter or keyboard. The program concentrates on drill, practice and reinforced learning through eight phases of instruction. **Compu-Tations, Inc.**

Typing Teacher, $22.95
TRS-80 Models I and III, 16K; Model 100, 8K.
Consists of a seven part package which begins with initial familiarization of key location, through words and phrases to complete mastery of the keyboard. "On screen diagrams show correct placement for fingers to master proper techniques. **Instant Software, Inc.**

UES Microcomputer Courseware with Educational Software, $1,700
Apple IIe, Commodore 8032, IBM PC, TRS-80 III.
A complete computer literacy course which teaches keyboard operations, BASIC language, how to print, calculate, use disk files and how to create and use your own software. **United Education & Software.**

Understanding Computers, $266
Apple Models II and II Plus, 48K, DOS 3.3 w/language card.
An introduction to basic computer literacy concepts, providing instruction in the history of computers, fundamental applications, hardware, software, programming and future computer uses. **Encyclopaedia Britannica Educational Corporation.**

Vanilla Pilot, $29.95
Commodore Models 64 and VIC 20, 16-34K, 40 and 80 column screen.
Pilot language interpreter including Turtle Graphics. The Turtle's direction can be set to turn left or right. The pen can be set to any of the 16 colors in the CBM-64. This Pilot includes extensions such as FIND/TRACE, CHANGE and DUMP. **Tamarack Software, Inc.**

VisiCalc Programming: No Experience Necessary, $59.95
Apple Models II, II Plus and IIe; Atari Models 800 and 1200XL; IBM PC, TRS-80 III; 2 disk drives, 48K RAM.
A self-instructional disk and 225-page guide teaches new users how to use VisiCalc effectively in five to eight hours. It progresses from basic VisiCalc commands and functions through sophisticated applications. Allows first time users to build a profit analysis model from scratch and also includes five other program templates. Program requires any 16-sector version of VisiCalc. **Little, Brown and Company.**

Windrive, $20
IBM PC DOS.
Allows user to use Winchester Hard Disk Systems with the IBM PC. It supplies the program to configure, define volumes and format the hard disk. **Tall Tree Systems.**

Your First Programming Experience: Robot Probe, $49
TRS-80 III, 32K.
Students learn to think logically in this game which uses a pseudo language to introduce students to programming. A stranded robot only understands certain commands so students must learn to think logically to successfully complete the mission. **Sunburst Communications.**

INSTRUCTIONAL GAMES

Air Navigation Trainer, $40
Apple Models II Plus and IIe, 48K, DOS 3.3.
A navigation simulator designed for flight instructors and student pilots featuring a hi-res cockpit, sound effects, adjustable scale ground track map and adjustable winds. **Space-Time Associates.**

The Big Race, $19.95
Apple II, 48K, with Applesoft.
Using the excitement of a horse race to motivate children to learn the multiplication facts or times tables, it includes four levels of difficulty. **Nova Software.**

Bumble Games, $45-$65
Radio Shack Color Computer, disk drive or cassette, 16K extended BASIC.
Bumble, a creature from the planet Furrin, leads children, ages four to ten, through six games that teach the essentials of graphing positive numbers. Plays Tic Tac Toe and draws Bumble's picture. It includes single and two player games. **Follett Library Book Company.**

Bumble Plot, $45-$65
Radio Shack Color Computer, disk drive or cassette player, 16K extended BASIC.
Starts where Bumble Games leave off. Children, ages eight to thirteen, move through six games teaching the essentials of graphing both positive and negative numbers. It includes single and two player games. **Follett Library Book Company.**

Cartels and Cutthroats, $39.95
Apple, 48K, disk drive.
A strategy game designed to tax your business sense by putting you in charge of your own multi-million dollar manufacturing plant. Armed with up-to-date newswires, market summaries, P&L statements and special memos from department heads, you make the decisions. For beginner to advanced levels. **Strategic Simulations, Inc.**

Challenge II, $100/grade series
Apple Models II Plus and IIe; Commodore PET, 32K.
Designed to teach curriculum units. It contains three different programs on the sixth grade level and three on the fifth grade level consisting of The Computer Program, The Game, The Questions and Activities, The Complete Vocabulary, The Reproducible Crossword Puzzle and The Bibliography. **Right On Programs.**

Chess 7.0, $69.95
Apple; Atari; 48K, disk drive.
A program for enhancing daily problem solving and concentrated thinking skills. **ODESTA.**

Computer Facts In Five, $26
Apple, 48K; Atari, 48K, IBM PC, 64K.
One or more players participate by selecting from more than 1,000 popular and academic subjects. The object is to associate answers with the five classes and categories selected. **Avalon Hill Microcomputer Games.**

Computer Math Games, Volumes 1-7, $324
Apple Models II, II Plus and IIe; DOS 3.3, 32K.
Math games that provide fact practice, skill drill, vocabulary review and problem strategy work for one to four players. Supplements any basal mathematics series. No programming knowledge required. **Addison Wesley Publishing Company.**

Cookie Monster Munch, $34.95
Atari VCS 2600.
A maze game which develops mapping skills for young children. In the easiest versions, the child moves the Cookie Monster along the maze path, gobbling cookies along the way. At difficult levels, the child becomes the "cookie kid" who tries to pack up cookies and return them to the jar before Cookie Monster catches up. **Atari, Inc.**

Delta Drawing, $39.95-$49.95
Apple Models II Plus and IIe, 48K; Atari Models 400, 800 and 1200, 48K ROM; Commodore 64; IBM PC, 64K, color card; printer optional.
Lets children create colorful drawings on the computer screen by using single key commands to control the cursor. One or more drawings can be nested inside one another, building complex drawing programs. Programs can be used in graphics or text mode. **Spinnaker.**

Ducks, $12.95-$14.95
Commodore Models 64 and PET, 16K; cassette or diskette.
A flock of ducks swims on the screen, the child counts them and enters a response. If correct, the ducks quack and fly away. If wrong, the child is given a second chance then the computer assists. Up to 20 ducks appear. **Micrograms, Inc.**

Educhess, $50
IBM PC, 64K, disk drive, DOS, BASIC, color/graphic adapter, 80 column B&W or color screen.
Allows user to play chess within one hour after starting. Provides practice. **Europro, Inc.**

Edufun, $34.95-$36.95
Apple II, 48K; Atari 32K, 16K.
A series of educational games which combine educational value and computer-generated fun. Each package contains two learning games. Over 60 pages of support materials for students and teachers are included. **Milliken Publishing Company.**

The Edu-Pak, $24.95
Commodore 64 Color Computer.
Contains four programs. *Ruler* puts the player in charge of a country and lets

him/her rule as long as s/he can. *Micro* provides the player the opportunity of running a computer manufacturing plant. *Dungeon of Mathecos* has the player search for treasure by answering math problems. *Geography* lets the player match locations around the world and U.S. **Computertist.**

Fastrack Quizzer, $39.95
Apple Models II and IIe, 48K, disk drive, DOS 3.3.
By answering questions, students race their cars around the track. The faster they answer, the faster their cars will race. Comes with ready to play quizzes or you can add your own quizzes. **Creative Publications.**

Final Consonant Bingo Bonanza, $9.95-$14.95
TI 99/4A, tape recorder.
Bingo is used to provide randomly selected word patterns emphasizing final consonant word endings. Each game board presents a different choice. The program keeps a record of the users' progress. Music, graphics and audio prompts add interest. **Computer Ed.**

Finger Painting and Color Book I, $34.95
Apple II, 48K with Applesoft.
Designed for children, age three and up, it allows them, with the help of a joystick, track ball or game paddles, to finger paint with any of the computer's hi-res colors. Color book contains 10 pages of various illustrations and one blank sketching page. This is a two program package. **Nova Software.**

Following Directions, $49.95
Apple Models II Plus and IIe, disk drive.
Players must follow directions to get from one place to another. Game plays differently every time it's used, as the method for play is dependent upon the route the players are directed to follow prior to the start of the game. Landing on certain spaces gives player an opportunity to answer questions. Reading selections focus on giving directions. **Learning Well.**

Gertrude's Puzzle, $44.95
Apple Models II, IIe and II Plus, disk drive, color monitor.
Allows the analysis of complex logic puzzles using hand designed computer graphics. It sharpens abstract thinking and reasoning skills and features six different games for ages six and up. **The Learning Company.**

Gertrude's Secrets, $44.95
Apple Models II, IIe and II Plus, disk drive, color monitor.
Allows players to solve challenging color and shape puzzles with puzzle pieces they can design. Learn to recognize patterns and categories. Features seven different games. For ages four through nine. **The Learning Company.**

Gomoku/Decipher, $19.95
TRS-80 Models I, III and IV, cassette or diskette.
Gomoku is a version of the ancient oriental board game. The object is to get five markers in a row on an 11" by 11" board. *Decipher* is a stimulating wordpuzzle exercise. One to five players compete at any one of five levels of difficulty as they attempt to decipher a scrambled word. **Basics and Beyond, Inc.**

The Great Computer Gameworks, $59.95
Apple Models II and IIe, 48K, disk drive, DOS 3.3.
Students select one of three racetracks and their own playing pieces for each game. The faster they answer the questions, the faster their playing pieces move. No programming required to create quiz questions. It has a one and two player option. **Creative Publications.**

High Rise, $35
Apple Models II and IIe.
An arcade-type game, focusing on planning skills, eye-hand coordination, shape perception and logic, it consists of moveable shapes arranged in columns, has 24 levels marked by increasingly complex shapes and fewer columns to choose from. **Micro Labs.**

Juggles' Rainbow, $37-$50
Radio Shack Color Computer, disk drive or cassette player, 16K extended BASIC.
For preschool to first grade levels, Juggles the Clown prepares youngsters for school with six games that promote reading and math readiness skills. Games include spatial concepts, eye-hand coordination, matching colors, recognizing opposites and using words to give directions. Contains one and two player games. **Follett Library Book Company.**

Learning with Leeper, $34.95
Apple.
Children too young to read can learn basic skills such as counting, eye-hand coordination and number, shape and color recognition and be introduced to computers with the four separate games included. The games are played with a joystick. **Sierra-On-Line.**

Letter Man, $24.95-$34.95
Apple II; Commodore Models 64 and VIC 20; IBM PC.
Teaches typing and increases typing speed through play. User is placed in a maze filled with words, letters and numbers and is chased by gobblers whose speed is set by the player. **Behavioral Engineering.**

Master Match, $39.95
IBM PC.
A quiz show emcee invites the player to find logical matches in images and words under numbered mystery squares. Players use visual memory, factual knowledge and reasoning skills to win points. **Computer Advanced Ideas.**

Match-em/Challenge Match-em, $14.95
TRS-80 Models I, III and IV, cassette or diskette.
Match-em is a two student memory and concentration game and has three different skill levels. *Challenge Match-em* is played against the TRS-80 and has four different skill levels. **Basics and Beyond, Inc.**

Memory Builder: Concentration, $16.95-$23.95
Apple II, 32K; Atari, 16 and 24K.
Tests user's powers of concentration, memory and attention span by matching pairs of words hidden behind the grid of boxes on the screen. The games get tougher as players progress. The computer keeps score. **Program Design, Inc.**

Millionwaire, $49.95
Apple 48K, 2 disk drives.
Players bet "Brain Bucks" on their ability to answer questions of varying levels of difficulty to win $1 million. Forty-two subject categories are available to choose from with three speeds for different age levels. **Brainbank, Inc.**

The Mindstretcher Series 1-5, $100-$125
Apple II Plus; Commodore PET.
Contains nine programs designed for gifted students in grades three to nine. The students are challenged to use analytical problem solving techniques to solve entertaining and educational puzzles. **Island Software.**

Moptown Hotel, $39.95
Apple Models II, IIe and II Plus, 48K, disk drive; Radio Shack Color Computer, 16K, disk drive or cassette player; color monitor.
In seven increasingly challenging games children test hypotheses, use analogies and develop strategic thinking skills. Children ages nine and up arrange Moppets in Moptown's fantasy world. **The Learning Company.**

The Mysteries of Wonderland, price TBA
Atari Models 400, 800 and 1200, 32K diskette, 16K cassette.
Aimed at improving the student's skills in visual perception, logical thinking and problem solving. The student embarks on a chase of White Rabbit before he reaches the door to Wonderland. **Walt Disney Educational Media Company.**

Nursery Time, $29.95
Apple Models II and IIe, 48K DOS 3.3.
An open-ended electronic book with music, color, animation, hidden letter challenges and prompt for own story. The two-sided disk totals 123 routines. It includes a backup diskette and a 13-page idea booklet. **Merry Bee Communications.**

Paint, $895 including a mouse
Corvus Concept, 16 and 32K, M68000-based workstation.
A comprehensive drawing, digitizing and composing program providing more than 200 commands and functions in a general graphics "tool box." The tools include a variety of dots, brushes, dithers, ribbons, lines, blocks, shades, patterns, frills and effects. **Corvus Systems.**

Painter Power, $40
Apple Models II and IIe, disk drive.
A graphics program allowing users to "paint" in different colors on the screen using paddles, keyboard, joystick or a combination of these. Beginner and advanced modes with six colors and variable speeds. Screens may be saved, reworked, printed as hard copy or made into slides. **Micro Labs.**

PRISM, $19.95-$24.95
Apple Models II and II Plus, 48K, DOS 3.3; Atari Models 400 and 800, 16K; IBM PC 64K.
Hidden in three separate locations are three keys. All the clues needed to find the keys are contained in the story of PRISM. A surprise climax to the adventure is revealed when all three keys are discovered. **International Software Marketing.**

Reading for Detail, $49.95
Apple Models II Plus and IIe, disk drive.
Players compete to be the first to arrive at the winner's circle in this horse racing game. When they land on specially-designated spaces, the players receive a chance to answer a question based on a short reading selection. **Learning Well.**

Shelby Lyman Chess Tutorial Series, $39.95
Apple; Atari; Commodore; Franklin; IBM PC.
Teaching the latest and most effective methods of chess instruction and artificial intelligence programming techniques, this package covers all aspects of the game from understanding basic chess weaponry to the subtle points of wit-matching. **Krell.**

South Pole, $14.95
Atari 800 32K; TRS-80 Models I, III and IV; cassette or diskette.
A simulation for one or two players that represents the race to discover the South

Pole. The players must use skill and good judgment to manage sled dogs, men, food and fuel in order to reach their destination. Players will encounter many of the difficulties of the original Scott and Amundsen expeditions. **Basics and Beyond, Inc.**

Spelling Bee Games, $29.95
Apple II, 48K, DOS 3.3 w/game paddles and Applesoft.
Designed for users ages four to seven, it has four colorful, hi-res games, including Squadron, Skyhook, Puzzle and Convoy, which strengthen the player's spelling and reading skills while exercising eye-hand coordination, memory and motor skills. **Edu-Ware.**

Spide Attack, $24.95
Apple Models IIe and II Plus, 48K, DOS 3.3
Player controls Spide and must reach the correct answer before opponent, but beware of the Dit—it can destroy! Teachers can create their own sentence and word lists from any subject area and design multiple choice, true/false and fill-in questions. Designed for grades one through eight. **Ahead Designs.**

Stickybear ABC, $39.95
Apple Models II, IIe and II Plus, 48K, DOS 3.3.
An alphabet program for ages three through six, featuring fully-animated pictures with sound. Displays objects that move over color backgrounds. Does not need special hardware. **Xerox.**

Stickybear Numbers, $39.95
Apple Models II, IIe and II Plus, 48K, DOS 3.3.
Allows children three through six to develop number recognition and build counting skills through play. Play objects include cars, birds, bears, hats and ice-cream cones. **Xerox.**

Teaching Tools, $24.05
Apple II; Commodore PET; TRS-80 Models I and II.
Shown a game board of numbered boxes, players uncover two boxes on each turn, trying to find those with matching contents. The program includes an authoring capability. Designed for one to four players, the computer can take the role of one player. **Teaching Tools.**

Teasers by Tobbs: Puzzles and Problem Solving, $35
Apple, 48K, DOS 3.3 with Applesoft.
A delightful character called Tobbs introduces two programs designed to help students decide which number can't be, might be or must be the missing number in grid problems. It includes six levels of difficulty. **Sunburst Communications.**

Three Mile Island, $39.95
Apple Models II Plus and IIe, 48K.
Player takes charge of a nuclear reactor in this educational simulation game. Avoid a melt-down and make a profit. Combines education and entertainment. **MUSE.**

Tic Tac Show, $39.95
Apple Models II Plus and IIe; IBM PC.
Uses animated color graphics with the appearance of a TV game show. Educates, while entertaining children ages four through twelve, about varied subjects such as presidents, French vocabulary, body systems, math problems and more. It includes an easy-to-use authoring system. **Computer Advanced Ideas.**

TM Game, $30
IBM PC, 64K, disk drive, DOS, BASIC, color/graphic adapter, 80 column B&W or color screen.
A way for kids or adults to sharpen their math skills. The functions of addition, subtraction, multiplication and division are available with three levels of difficulty. **Europro, Inc.**

Triple Brain Trust, $30
IBM PC, 160K or 320K disk drive, color/graphics monitor adapter, DOS 1.1, 64K memory or DOS 2.0, 128K memory, advanced BASIC.
This game can be used repeatedly, each time with new questions. Players choose from categories such as word recognition, reading, question-answering, skills, geography, vocabulary and movies. Players can also write their own questions. **Reston Publishing Company.**

Wordrace, $24.95
Apple; Atari; Commodore 64.
A fast-paced educational word game with an accessory disk and Claim to Fame/Sports Derby which includes famous people in history and sports. **Don't Ask Computer Software.**

LANGUAGE ARTS

Alphabet Zoo, $29.95
Apple Models II and IIe, 48K, Atari, 48K, Joystick, Commodore 64, 64K, Joystick; IBM PC 64K, color card.
A combination of two maze games that teach the relationship between sounds, letters and sharpen skills. **Spinnaker.**

The Antonym Game and The Vocabulary Game, $29.50 each; $57/set
Apple Models II and IIe with Applesoft, 48K.
Two baseball games designed to help students in grades 10-12 improve their vocabulary and prepare for the SAT and similar examinations. **J&S Software.**

Basic Language Units: Grammar—Adjectives, $35 each, $215/set
Apple Models II and IIe, 48K, disk drive, TRS-80 III, disk drive, 48K.
An approach to developing or reviewing language skills including identifying articles and adjectives, recognizing the word being modified, recognizing comparatives and superlatives and practicing forming them. Presented with explanations, examples and exercises at each level. Advancement or remediation up to two levels. The set includes seven diskettes. **Continental Press, Inc.**

Basic Language Units: Grammar—Adverbs, $35 each, $215/set
Apple Models II and IIe, 48K, disk drive, TRS-80 III, 48K, disk drive.
An approach to developing or reviewing language skills including identifying adverbs, recognizing the word being modified, recognizing comparatives and superlatives and practicing forming them. Presented with explanations, examples and exercises at each level. Advancement and remediation up to two levels. The set includes seven diskettes. **Continental Press, Inc.**

Beyond Words 1, 2 or 3, $19.95-$23.95
TRS-80 Color Computer, 32K, extended color BASIC.
A three part, menu-driven program covering misspellings, synonyms and antonyms at all levels. **Computer Island.**

Blissymbolics: Bliss Drills, $35
Apple II, 48K with Applesoft BASIC in ROM.
Consists of a series of drills to help the student learn a symbol language for non-vocal people. Both Single Symbol Drill and Word-Symbol Drill can be operated through any switching device, game paddle or simple keyboard contact. **Minnesota Educational Computing Consortium.**

Calendar Spellings, $7.50-$9.50
Commodore Models PET, CBM and VIC 20
The student chooses whether to practice spelling the seasons, days or months. There are five seconds to study each word before entering it. A score is kept and corrected answers and spellings are shown at the end of each round. **Learning Software.**

Chambers of Vocab, $48.96
Apple Models II, II Plus and IIe, 48K, disk drive.
A maze game that teaches vocabulary skills in which players must use their word skills to escape from the maze by defeating the word-beasts that dwell within the chamber. **Reader's Digest Services, Inc.**

Classes of Nouns, $60
Apple; Commodore PET.
Helps teach recognition of common nouns, proper nouns and special classes of nouns. Designed for high school English students. **Brainbank, Inc.**

The Cloze Technique for Developing Comprehension, $34
Apple, Atari, Commodore PET, TRS-80.
Certain words are deleted from the reading passages. The deletions are then supplied by students who select from the alternative provided. Only one answer is correct when judged in the context of the whole reading selection. **Orange Cherry Media.**

Comprehension Power Program, $150/level
Apple II Plus, 48K.
Develops comprehension and study skills through preview skimming and comprehensive reading practice. Students may alter presentation rates and re-read as required. Responses to comprehension questions are stored for review by both students and teachers. **Instructional/Communications Technology, Inc.**

Consonant-Vowel-Consonant, $20-$24.95
Apple, 48K, disk drive; Commodore Models 64, CBM and PET 16K, cassette or diskette.
Seven steps are shown on the screen. A blank square, a vowel and a consonant appear at the bottom of each step. The student types in a beginning consonant to make a word. If a proper word is made a happy face appears and the student moves up to the next step. A sad face appears if the consonant does not make a word and no progress is made up the stairs. **Microcomputer Workshops.**

Create Vocabulary, $26.95
Apple II with Applesoft in ROM, disk drive, 48K, cassette player.
Designed to help teachers build vocabulary drills and individualized testing. The teacher adds the words and the student sees and hears it and indicates on the computer if s/he knows the word. **Hartley Courseware, Inc.**

Crypto-Cube, $39.95
Apple Models II and IIe; Atari Models 400, 800 and 1200XL, 48K, disk drive; IBM PC.
An educational computer word puzzle game featuring a cube which rotates. Each side of the cube exposes a grid similar to that found in a crossword puzzle. Players take turns uncovering letters to fill in the missing words. **The Bohle Company.**

Do-It-Yourself Spelling, $19.95
Atari 16K.
Allows the student to make up a list of words and program them into the computer with his/her own voice cassette. Lists of words that children should know from first grade on are included. Designed for all ages. **Program Design, Inc.**

Dragon's Keep, $29.95
Apple.
An adventure game with a controlled vocabulary for the second grade. It is played with the keyboard and accompanied by sound. Outline maps, peel-off stickers and compass decals are included. **Sierra-On-Line.**

Dumbo Flies Home, price TBA
Panasonic Home Computer, 32K, cassette.
Provides youngsters with an opportunity to develop reading readiness and word recognition skills. In order to help Dumbo fly safely back to the circus, players must match a picture to one from a group of four. At an advanced level, they match words to pictures. **Walt Disney Educational Media Company.**

English: Basic Mechanics, $95/module; $285/set
Apple Models II Plus and IIe, 48K, Applesoft in ROM, DOS 3.3 disk drive.
A set of 58 computer-based lessons arranged in three separate modules. Student takes a test to determine his/her skill level before starting each module. Programs state facts, check student answers and provide review and drill. Keeps complete records for student and teacher. **Educulture.**

English Basics—Part of Speech CP/DK Eng #1, $145-$170
Apple, 48K; Atari 800, 48K; Commodore Models 64 and PET, 16K; TRS-80 32K diskette, 16K cassette.
A 20-program series covering the five parts of speech including nouns, pronouns, verbs, adjectives and adverbs. Each part contains four tutorial-drill programs. Each part of speech may be purchased separately for $34.95 on cassette of $39.95 on diskette. **Educational Activities, Inc.**

English Grammar Drills, $200
Apple Models II Plus and IIe, 48K, 3.3 DOS.
Children can gain practice in the areas of grammar that often cause problems. Exercises are broken down into approximately 10 minute segments and use varying forms to hold interest. Includes four diskettes. **Com-Press.**

Foreign Language Classroom Words, $45
Apple II Plus, Atari 800; TI 99/4A
Provides drill and practice on words that are helpful to students studying a foreign language. It contains 500 classroom words divided into 10 categories including reading, writing, arithmetic, general science (plants and animals), social studies, language, athletics, art, music and names of countries. Available in Spanish, French and German. **Plato Educational Courseware-Microcomputer.**

Foreign Language Vocabulary Drill, $24.95
Apple II, 48K; Atari 800, 48K, printer optional.
A drill and practice program available for either German, French or Spanish to English translation and vice-versa. The program includes several practice files and allows the teacher, parent or student to develop additional specific files. **Compu-Tations, Inc.**

The French Game, $34.50
Apple Models II and IIe, 48K, disk drive.
An automobile racing game designed for beginning, intermediate or advanced French students. It contains almost 1,000 words of varying difficulty. Words are displayed in upper/lower case, using special accent marks when needed. **J&S Software.**

French and Spanish Foreign Language Series, $80
Apple II Plus, Commodore PET.
Uses graphics to present oversized words and diacritical marks. The first program has nouns grouped in convenient topic areas. The second uses verbs grouped according to end type. The third uses numbers, colors and months. The fourth allows the teacher to create customized word lists. **Island Software.**

Fundamental Punctuation Practice, $95-$135
Apple II, Applesoft, 48K disk, 3.3 DOS; TRS-80 Models I and III, 16K, and 48K, IBM PC.
More than 30 lessons in punctuation skills including periods, sentences, abbreviations, initials, question marks, commas, dates, addresses, quotes, conjunctions and more. **Random House, Inc.**

Grammar and Writing, $268
Apple Models II and II Plus, 48K, DOS 3.3 w/language card; TRS-80 III, 48K.
Composed of four individual diskettes covering the parts of speech, sentence patterns, usage and paragraphs. An exploration theme generates interest and provides educational content. It provides immediate feedback on students' performance and includes a variety of exercises, definitions of terms and a record sheet to enable the teacher to monitor the programs. **Encyclopaedia Britannica Educational Corporation.**

Grammar Mastery Series, $195
Apple Models II, II Plus and IIe, 48K, disk drive, DOS 3.3.
Aimed at proven areas of persistent difficulty for students, based on the American Language Academy's experience in teaching English. These materials have been developed independently of specific textbooks and should be easy to integrate into most ESL/EFL curricula. **American Language Academy.**

Green Screen Stories, $20
IBM PC-DOS, BASIC, 64K.
Stories for young readers with dictionary questions and activities. The books include *Small Tales* for ages 6-10, *Grimm's Fairy Tales* for ages 8-12 along with the books *Myths* and *Spring Welcome Around the World*. **D. M. Studios.**

Handwriting Skills, $39.95
Apple II, Apple Graphics Tablet, 48K.
A teacher can graphically demonstrate the correct formation of manuscript letters, cursive letters and even cursive letter connections and combinations. Using an Apple Graphics Tablet, teachers can enter any or all of these letters to be used in the handwriting instruction process. **Learning Systems, Ltd.**

Homonyms, $40
Apple II, DOS 3.3; TRS-80 III 32K; Atari Models 400 and 800, 32K.
Designed for grades 3-12, this educational drill game contains 60 sets of homonyms in four different modules with three different levels of difficulty. The tutorial mode presents each homonym and its definition. A concentration mode lets the student match homonyms with definitions and a quiz mode allows the student to be tested on all 60 sets of homonyms. **Teacher Support Software.**

Junior High Language Arts, $800
Apple Models II and IIe, 48K RAM with Applesoft BASIC, 5¼" disk input, 3.3 DOS and video display.
An eight-disk series which combines the final four disks of Word Structure and the final four disks of Sentence Structure to provide a comprehensive language arts program that is appropriate to the needs of the junior high school student. **Borg-Warner Educational Systems.**

Junior High Spelling, $25
TRS-80 I, 16K, Level II cassette or diskette.
Using multiple choice format, it reinforces spelling skills by requiring the student to type correctly-spelled words. It rewards correct entries by showing graphic displays. **Educational Software Consultants, Inc.**

Kid Bits Words Fair, $100
Apple II with Applesoft, 48K, disk drive, DOS 3.3.
A drill and practice package using graphics for reinforcement. With each correct answer the student adds another feature to a colorful clown face. It has the ability to create new lessons quickly and can handle an unlimited number of lessons and students. **Potomac Micro Resources, Inc.**

La Corrida De Toros, $27.95
Apple Models II Plus and IIe, 48K, DOS 3.3, TRS-80 Models I and III.
Spanish hangman for beginners and intermediates. **Gessler Publishing.**

Language Arts, $79
Atari Models 400 and 800; TRS-80.
A 16-part series leading to developing a student's communication skills. Each program introduces 20-30 new words in context with definitions. Audio narration is provided and multiple-choice answers allow the student to progress only when the correct answers are given. **Dorsett Educational Systems, Inc.**

Language Skills, $275/diskette series, $29.95/single; $225/cassette series, $24.95/single
Apple Models II and IIe; TRS-80 Models I and III, cassette or diskette.
Programs use a conversational approach to teach language. Drill sections using randomly-selected practice sentences enable students to apply their knowledge. **Aquarius.**

The Latin Hangman, $29
Apple Models II, II Plus, IIe and III.
Teaches famous Latin sayings and common sentences with a hangman game. The vocabulary sections contain common Latin vocabulary drills similar to flash cards. **George Earl.**

The Linguist, $39.95
Apple Models II Plus and IIe, 48K, DOS 3.3, Applesoft in ROM.
A general purpose utility program for creating translations and tutorials in any of 20 languages. **Gessler Publishing.**

Magic Spells, $40-$48
Radio Shack Color Computer, disk drive or cassette player, 16K extended BASIC.
With spelling and word unscrambling games, players develop visual and mental agility and spelling skills. This program features Magic

Spella, a word list editor and lists of spelling "demon" words for the elementary grades. **Follett Library Book Company.**

Mastering Affixes, Compounds and Syllables, $59.50
Versator Educational Computer.
Students identify plurals, prefixes and suffixes and recognize words that contain these modifiers. Compound words are identified as two base words combined to find a true compound. Syllabication includes identifying how words are divided by several basic rules. Six lesson modules contain over 600 words. **Centurion Industries, Inc.**

Mickey in the Great Outdoors, price TBA
Atari Models 400, 800 and 1200, 32K diskette, 16K cassette.
Students help Mickey along his expedition by finishing incomplete sentences, creating words out of random letters, finishing incomplete equations and rearranging numerical sequences into their correct order. **Walt Disney Educational Media Company.**

Milton Bradley Microcomputer Software, $49.95
Apple Models II Plus and IIe, Applesoft BASIC, 48K, DOS 3.3.
Language programs for middle grades and up consisting of activity sheets and program diskette. Content areas include commas, endmarks, building better sentences, reading comprehension, context clues, prefixes and suffixes. **Milton Bradley.**

Missing Links: A Game of Language and Letters, $45-$55
Apple II with Applesoft BASIC, 48K, DOS 3.3; Atari 800 with Atari BASIC, 48K; IBM PC, 64K
Passages from classic books appear with missing letters and words and act as a language puzzle that improves reading, writing, spelling, grammar and comprehension skills. Helps student appreciate syntax, vocabulary and the mechanics of writing. **Sunburst Communications.**

Multiple Skills, $92.95
Apple II with Applesoft in ROM, disk drive, 48K, cassette player.
A variety of lessons covering root words, affixes, homonyms, compound words, plurals and contractions with a first through third grade vocabulary level. The instructions are presented to the student on tape with the use of the CCD. **Hartley Courseware, Inc.**

Nouns, $9.95-$14.95
TI 99/4A console, cassette player.
Provides practice in identifying types of nouns. Graphics, color and animation add interest and sustain motivation. An Edu-Sack which includes a cassette tape along with reproducible follow-up games or activity sheets and program documentation is also available. **Computer Ed.**

Old McDonald's Farm, $14.95
Radio Shack Color Computer; TDP 100, 16K RAM or other color computer; 16K extended BASIC.
A drill program on the long and short vowels. Contains tape recorded audio messages. Children actually hear someone speaking to them while they are working with the program. **Tokaym Corporation.**

Painless Punctuation, $87
Apple, Atari, Commodore PET; TRS-80.
The student chooses the punctuation in some humorous and interesting passages. Incorrect responses get a short review of the punctuation rule involved. Students get to see the need and reason for using punctuation. **Orange Cherry Media.**

Passive Voice Module, $62.50/master diskette; $25/expansion diskette
Apple II Plus and disk drive.
For secondary English and ESL students, it consists of a screening exercise and three practice exercises, each with a different format, a random selection of problems and branching for review. Also included is an automatic scoring and record-keeping system. **River Bend Software.**

Phrase-Reading, $49.95
Apple Models IIe and II Plus.
Uses famous short stories designed to assist slow secondary readers at reading levels two to four. Beneficial for special education and non-English speaking students. **Creative Curriculum.**

Processing Power, $180
Apple Models II Plus and IIe, disk drive, monitor.
Helps students progress from isolated word recognition to fluent silent reading. Unique computer-based tachistoscopic training techniques heighten a reader's ability to rapidly and accurately store words in short term memory. The programs have both a development and special education track. Includes six diskettes. **Bell and Howell.**

Proof It, $34.95
Apple II Plus, 48K, DOS 3.3.
Stories suggested by children's own writing with their own errors are used to develop a pattern for proofreading. **Merry Bee Communications.**

Puzzleit, $100
Apple Models IIe and II Plus; Commodore PET
A group of programs that graduate in difficulty from the simplest three letter words to the most difficult six and seven letter word ladder puzzle. **Right On Programs.**

Reading Comprehension in Social Studies, $50 each; $225/set
TRS-80 I, 16K, level II cassette or diskette.
A series of programs to improve reading comprehension while providing information about important moments in history. A total of five series can be ordered separately or as a set. **Educational Software Consultants.**

Reading for Comprehension, $372
Apple Models II and II Plus, 48K, DOS 3.3 w/language card and disk drive.
Contains six stories and exercises to strengthen skills in the areas of comprehension, word meaning, synonyms, antonyms or homonyms, composition, sentence structure, punctuation, dictionary use, vocabulary and spelling. **Encyclopaedia Britannica Educational Corporation.**

Reading Comprehension: What's Different?, $16.95-$23.95
Apple II; Atari, 8-16K.
Contains a total of 200 exercises to challenge reading comprehension and analytical skills. Designed for ages eight and older. **Program Design, Inc.**

The Reading Machine, $59.95
Apple II with Applesoft in ROM, 48K RAM, disk drive.
Covers reading skills taught typically in kindergarten through third grade with over 28 instructional objectives. Record keeping, reinforcement system included. **Southwest Ed-Psych Services.**

Reading Skills Courseware Series, $58.95
TI 99/4A.
Following the teach/practice/apply/assess instruction pattern, the reading skills series covers word identification, comprehension, study and research and literary understanding and appreciation. **Scott Foresman.**

Rhymes and Riddles, $29.95
Apple Models II Plus and IIe, 48K; Atari Models 400, 800 and 1200, 48K; IBM PC 64K, color card; Commodore 64.
A letter guessing game presented in three formats including nursery rhymes, riddles and famous sayings. An easy-to-follow booklet is included. **Spinnaker.**

Scramble, $15.95
Apple Models II Plus and IIe, 48K, DOS 3.3.
A program that allows teachers to make their own word lists. Each list contains 20 words. Students unscramble words while learning to spell. Designed for grades one through six. **Ahead Designs.**

Senior High Spelling, $25
TRS-80 I, 16K, Level II cassette or diskette.
Designed to improve skills at the senior high level, the format requires students to select the correctly spelled word and type it on the keyboard. Word lists for college-bound students included. **Educational Software Consultants, Inc.**

Sentence Structure, $600 (option to rent)
Apple Models II and IIe, 48K RAM with Applesoft BASIC, 5¼" disk input, DOS 3.3, video display.
An eight-disk series designed to help middle grade through junior high students to communicate more effectively by providing individualized instruction and practice in basic sentence analysis. Automatic student placement and tracking are included with a built-in management system. **Borg-Warner Educational Systems.**

Sentence Structure Skill Building Adventures, $59.95, $299/set
Apple Models IIe and II, 48K, DOS 3.3, disk drive.
Programs include Sentence Sense, Subjects and Predicates, Verbs and Complements, Sentence Patterns, Clauses and Verbals. Each is designed in a game/reward structure combined with colorful graphics and animation. **Society for Visual Education, Inc.**

Sequence, $49.95
Apple Models II Plus and IIe, disk drive.
Players arrange short reading selections by topic and order them in groupings of sequential paragraphs. Players use the computer keyboard to place the paragraphs in proper sequence as they appear on the screen. **Learning Well.**

Speedread+, $84.95-$79.95
Apple Models II, II Plus and IIe, Atari Models 400, 800 and 1200; Commodore 64, IBM PC.
Designed to teach faster, more efficient reading in just 10 minutes a day. Operates from 5-500 words per minute in four different training modes. **Inst Corporation.**

Spellicopter, $39.95
Apple Models II Plus and IIe; Atari Models 400, 800 and 1200XL, IBM PC; 48K, disk drive.
A computer-based spelling game in which the pilot must accomplish a mission that requires keen memory, verbal, spelling and navigation skills. **The Bohle Company.**

Spelling Bee, $33
Atari Models 400 and 800, 16K, Atari BASIC in cartridge
Four-hundred keywords and sentences are listed in the support manual along with instructions for modifying drills. An easy editor allows the teacher to modify the drills or create new ones. **Minnesota Educational Computing Consortium.**

Spelling Demons and Unscramble, $59.50
Versator Educational Computer.
Combines the skill of mastering irregularly spelled words containing double consonants, silent letters and homonymns and the challenge of building one to four new words from a group of scrambled letters. Eight lessons contain a total of 257 words plus 115 hidden words. **Centurion Industries, Inc.**

Spelling Drill/Spelling Review, $19.95
Atari 800, 32K, TRS-80 Models I, III and IV.
A two program package for all grade levels. It provides a custom made spelling drill and reviews problem words in common usage. **Basics and Beyond, Inc.**

The Spelling Machine, $49.95
Apple II with 48K RAM, Applesoft in ROM, disk drive.
Contains 700 words and sentences for all grades. Includes a reinforcement system, record keeping and text editing system for insertion of user selected words. **Southwest EdPsych Sources.**

Spellings—The States, $7.50-$9.50
Commodore Models PET, CBM and VIC 20 with cassette.
The States are divided into five groups alphabetically. The student chooses which one to practice. Corrected answers are shown, scores are kept and students can repeat the same list or try another. **Learning Software.**

Spelling Wiz—DLM Academic Skill Builders, $44
Apple Models II Plus and IIe, DOS 3.2 or 3.3.
A wizard who uses his magic wand to zap missing letters into words assists students in spelling words commonly misspelled from grade levels one through six. One of six packages included in Academic Skill Builders. **DLM, Inc.**

Storybook Animals and Things, $24.95/diskette, $19.95/cassette
Atari Models 400 and 800, 24K diskette, 16K cassette.
As many as four students work simultaneously using joysticks and moving their numbered cursors around the screen's playfield to solve word puzzles like word search, crossed-word, scramble and quotation. **Edupro.**

Subject-Verb Agreement Module, $62.50
Apple II Plus, disk drive.
For secondary English and ESL students, it consists of five exercises, each featuring a varied format, random selection of problems and branching for review. The module includes an automatic scoring and record keeping system. **River Bend Software.**

The Talking Alphabet, $24.95
Apple II 48K with Applesoft.
Children as young as three can use this program to hear and see the upper and lower case alphabet. It also draws letters slowly so that the children can trace them on the screen with their fingers. Also counts and draws numbers. **Nova Software.**

Teachers' Friend, $15
Apple, Radio Shack.
Teaches English as a second language to students who can read English at the second grade level. Each lesson takes about 10-15 minutes to complete, however the computer will progress at the students' rate. **Soft Spot Ltd.**

Trickster Coyote, $48.96
Apple Models II, II Plus and IIe, 48K, disk drive.
An adventure game for ages eight through adult. It teaches vocabulary words by having the user stay on Coyote's trail avoiding his tricky words. **Reader's Digest Services, Inc.**

Tutorial Comprehension, $840-$995
Apple II, Applesoft, 48K, DOS 3.3; TRS-80 III, 48K diskette, 16K cassette.
Provides tutorials and practice lessons in five key comprehension skills, including main idea, details, sequence, inference and critical reading. **Random House, Inc.**

Verbs, $9.95-$14.95
TI 99/4A, cassette player.
Provides practice in identifying types of verbs. Graphics, color and animation. An Edu-Sack includes a cassette tape along with reproducible follow-up games. **Computer Ed.**

Visual Vocab, $29.95
Apple II Plus, 48K, DOS 3.3.
Develops an understanding of adjectives by conceptual categorization with known synonyms. Two study and two evaluation programs use 26 and 12 levels of difficulty. **Merry Bee Communications.**

Vocabulary Builder 1, 2, 3, $19.95-$23.95
TRS-80 Color Computer, 32K, extended color BASIC.
A 200-question, 1,000-word vocabulary practice program in four part multiple choice format. Available for grades three-five (level I), grades six-eight (level II), or grades nine-twelve (level III). User modifiable. **Computer Island.**

Vocabulary Building Games, $59.95-$69.95
Apple Models II, II Plus and IIe, 48K, Atari Models 400 and 800, 24K diskette, 16K cassette.
Includes four packages called Astro Quotes, Time Bomb, Kross N Quotes and Minicrosswords. Kross N Quotes not available for Apple version. **Program Design, Inc.**

Warrior Words, $12.95-$14.95
Commodore Models 64 and PET, 16K; cassette or diskette.
Seven rows of words descend upon a city. By correctly typing a word and pressing the space bar the word is erased. The object is to clear consecutive screens of words in an attempt to save the city. **Micrograms, Inc.**

Whole Brain Spelling, $34.95
Apple Models II Plus and IIe, 48K, disk drive, color monitor.
Uses the graphics color capabilities of the Apple to provide positive user feedback and to emphasize visual aspects of the learning process. Available in six word-list categories, including General, A Child's Garden of Words, Fairy Tales, Medical, Secretarial and Scientific. **Sublogic.**

Wizard of Words, $39.95
Apple Models IIe and II Plus; IBM PC.
Knights, heralds, jugglers, a princess and a fire-breathing dragon help as the Wizard's wand makes five different word games appear. Over 20,000 words keyed to age levels. Words and lessons can be added to any game. **Computer Advanced Ideas.**

Word Attack, $49.95
Apple, IBM.
A vocabulary building system of 675 words in which the words and sentences illustrating usage are presented on nine different levels for students ages eight to adult. It has an editor to enter additional word lists. **Davidson & Associates.**

Word Division, $19.95
Apple Models II Plus and IIe, 48K, DOS 3.3.
Each student commands a laser and attempts to divide the word correctly before time runs out. Students can learn about prefixes, suffixes, compounds and syllables. Supplied with 2,000 words for grades one through six. **Ahead Designs.**

Word Factory, $67
Apple, Atari, Commodore PET, TRS-80.
This program set gives students the opportunity to change words and create new ones. It includes a set of two diskettes. **Orange Cherry Media.**

Word Functions, $99
Apple, Commodore PET.
A total of nine separate programs in two parts. Part I includes homonyms, a homonym matching game, synonyms and a synonym matching game. Part II includes antonyms, more antonyms, troublesome words (to/too/two) and troublesome words (it's/its). **Brainbank, Inc.**

Word Master—DLM Academic Skill Builder, $44
Apple Models II Plus and IIe, 48K, DOS 3.2 or 3.3.
Gives students practice identifying pairs of antonyms, synonyms or homonyms at three difficulty levels, while racing against time and advancing electronic rays. **DLM, Inc.**

Word Memory, $50
Apple II, DOS 3.3; Atari Models 400 and 800, 32K; TRS-80 III, 32K.
Designed to improve word sequencing using a time limit. A choice must be made about the number of words (1-5) to be remembered in the sequence. The selected list (10-20 words) is displayed in review. Selected memory words appear on the screen for 10 seconds and then disappear. These words must be found in the list and their corresponding numbers entered sequentially. A total of 10 games may be played. Designed for grades one through six. **Teacher Support Software.**

Word Memory, $65
Apple Models II Plus and IIe, disk drive, monitor.
Features tachistoscopic word recognition exercises that improve visual efficiency, perceptual accuracy and visual memory. Students learn to recognize target words that improve silent reading skills. The programs are correlated lesson by lesson. **Bell and Howell.**

Word Memory Programs, $65
Apple II Plus, 48K.
A game-like recognition activities with key level one vocabulary from major basal reading series, as well as I/CT's beginning reading vocabularies for elementary and secondary/adult students. It provides left-to-right visual functional and tachistoscopic word recognition practice at rates for individual needs. **Instructional/Communications Technology, Inc.**

Word Power, $19.95
Apple II, 48K, printer optional.
A drill and practice program designed to help anyone from the third grade up increase vocabulary. Includes several practice files and users can input, revise, store and retrieve their own specific files, each including up to 30 words. **Compu-Tations, Inc.**

Word Roots, $39
Apple, 48K, DOS 3.3.
Self-paced instruction designed to improve vocabulary skills through the understanding of word roots and families. **Educational Courseware.**

Word Scrambler and Super Speller, $19.95
Apple II, 48K, DOS 3.3 with Applesoft.
Designed for students in kindergarten through college, these programs teach spelling, review missed words and provide word unscrambling exercises. The user provides the word lists. **Avant-Garde Creations.**

Word Zapper, $12.95-$14.95
Commodore Models 64 and PET, 16K, cassette or diskette.
Contains over 200 correctly spelled words and an equal number of misspellings. The student zaps misspelled words. If 12 errors are made, the zapper machine stops and a lesson and spelling drill are provided. **Microgrems, Inc.**

Writing Competency Practice CP/DK 20190, $85
Apple; Commodore Models 64 and PET; TRS-80.
Instructs the student in the basic writing skill areas of letter writing, report organization and persuasion. Provides tutorial instruction and motivating graphic rewards. **Educational Activities, Inc.**

Zaner-Bloser Spelling Schoolware, $19.95
Apple II, 48K, DOS, disk drive; Commodore Models 2000, 4000 and 8000, 32K, disk drive; TRS-80 III, 48K, DOS, 2 disk drives.
Includes eight computer diskettes, one for each grade level and each with eight spelling activities for learning to spell. It can program user's own words or the ones provided. **Zaner-Bloser Educational Publishers.**

LIBRARY AND MEDIA AIDS

The Animator, $49.95
Apple Models II, II Plus and IIe.
A system for producing and running animated film strips that uses only key frames and calculates the in-between frames. Demo includes a ballet sequence. **Balbo Software Systems.**

Bookworm, $99
Apple Models II Plus and IIe, 48K disk drive, CPM, monitor; TRS-80 Models I and II, disk drive option.
A library circulation program to monitor overdue books for school libraries which will store up to 1,500 books, print over-due notices and allow search and sort for up to six categories. **J. L. Hammett.**

Computer Cat, $1,995
Apple II Plus, 64K or Bell and Howell equivalent, hard disk drive.
A computerized replacement for the card catalog available in both a single-user and multi-user version. Features include password access to complete records, complete reporting capabilities, screen directions for all functions and more. Allows the user to search any subject, author or title while the librarian can be printing reports at another station. **Colorado Computer Systems, Inc.**

Libstats, $25
CP/M, in CBASIC2, dual 320KB/disk drive and 132 character printer.
A utility class program which allows daily input of circulation statistics for all circulated materials based on Dewey Classification along with both nonprint equipment and miscellaneous items. **School Management Systems.**

Media and Equipment Management DK-28000/28010, $98
Apple; Commodore Models 64 and PET 16K, TRS-80.
Designed to assist the media and audiovisual specialist in handling management tasks in an efficient and effective manner. For use in schools and libraries. **Educational Activities, Inc.**

Researchit, prices listed individually, below
Apple Models II Plus and IIe; Commodore PET, 32K.
Series has six Researchit programs that familiarize students with six reference tools which include The World Atlas ($60), Reader's Guide to Periodical Literature ($45), Roget's Thesaurus ($60), The World Almanac ($100), A Telephone Directory ($45) and Dictionary ($100). **Right On Programs.**

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Executive Offices
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Hopkins School District 270
Evaluation Center/Room 248
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Hopkins, Mn. 55343

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612/473-1225

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Xerox
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2500 W. Fifth Avenue
P O Box 16764
Columbus, Oh. 43216

COMPUTER GRAPHICS

GRAPHICS

The term "computer graphics" usually refers to pictures, charts, graphs, maps, or other designs that are created on a computer.

You can create graphics by writing a program in BASIC (or other programming language) or you can create designs with graphics software.

There are two major kinds of graphics software:

> Graphing programs for creating graphs, are sometimes used together with electronic spreadsheets, and other general application programs.
>
> Drawing programs can be used for drawing pictures with or without special input devices.

- Graphing programs.

Many computer programs for creating graphs are "menu-driven." (i.e., PFS: Graph).
For example, you want to show in graphic form how many students were enrolled in ESL, Basic Ed, or GED.

((MENU))
SELECT:
1. Make a graph
2. Select a graph
3. Edit a graph
4. Print

At the main menu, you would probably pick the option "to make a graph," (1) You would enter:

STUDENT ENROLLMENT

Level	Number Enrolled
BE	
ESL	
GED	
TOTAL	

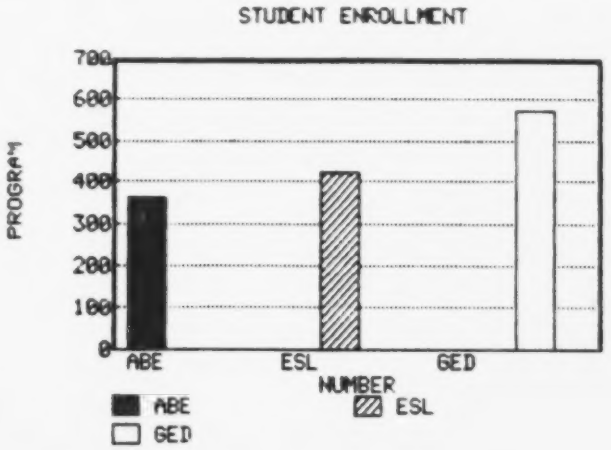
Returning to the main menu, pick the option that asks you to enter the data (i.e., the number enrolled) (3)

STUDENT ENROLLMENT

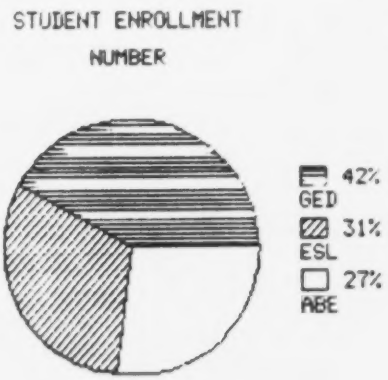
Level	Number Enrolled
BE	365
ESL	425
GED	575
TOTAL	1365

Returning to the main menu, you would now be ready to select the kind of graph you want to create. (2)

If you decide to ask the program to create a bar graph, your data would look like this:



If you ask for your data to appear in a pie graph, the program will sometimes change your new data into percentages and show a graphic like this:



- Drawing programs.

Many of the graphics software currently on the market can draw or "paint" all kinds of pictures of your own design.

Many young students are using LOGO to create drawings on their computer. LOGO is a programming language which calls the cursor (shaped like a triangle) a turtle - hence "turtle logo." With turtle logo, you can create geometric shapes and pictures.

Some software graphic programs use a graphics tablet (i.e., Koala Pad, Animation Station). A graphics tablet often looks like a small, lap-sized chalkboard connected to the computer. You draw on the tablet with a special pen (stylus) or your finger. The design then appears on the computer screen.

Computer graphics use one of three basic programming techniques to put a picture on the screen. The three include: (1) high - resolution graphics, (2) low - resolution graphics, and (3) character graphics.

Character graphics is done by simply printing letters or symbols from the keyboard onto the screen in such a way they make a pattern.

```
OK
10 PRINT "              X"
20 PRINT "             XXX"
30 PRINT "            XXXXX"
40 PRINT "           XXXXXXX"
50 PRINT "          XXXXXXXXX"
60 PRINT "         XXXXXXXXXXX"
70 PRINT "        XXXXXXXXXXXXX"
80 PRINT "             XXX"
90 PRINT "             XXX"
100 END

RUN
```

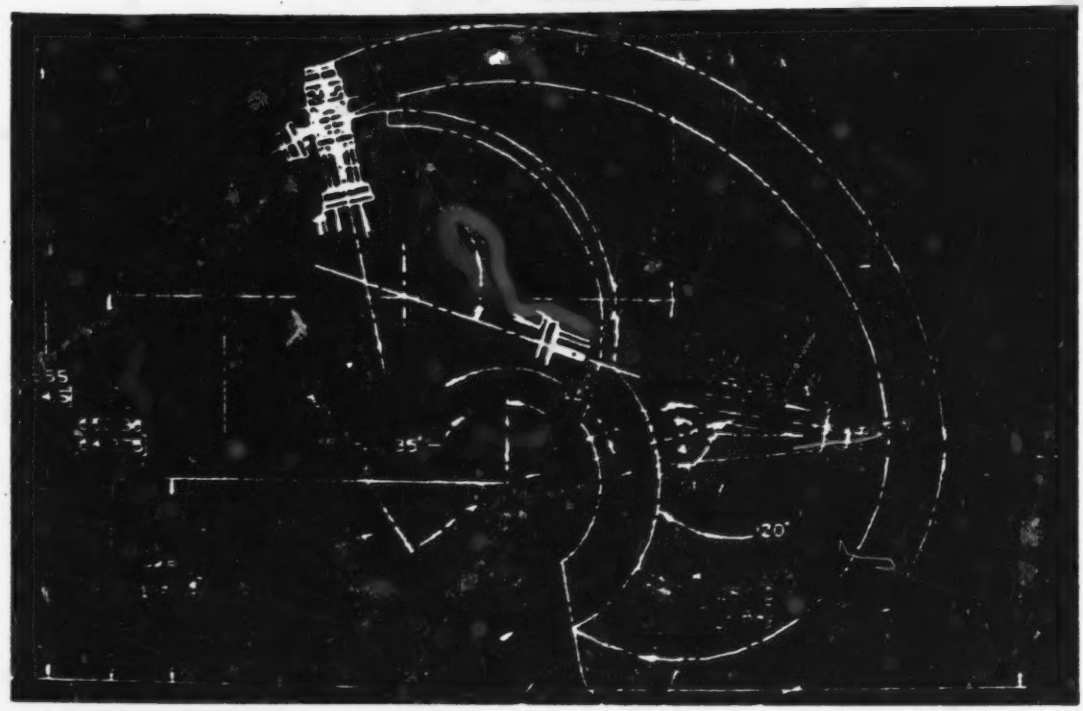
```
              X
             XXX
            XXXXX
           XXXXXXX
          XXXXXXXXX
         XXXXXXXXXXX
        XXXXXXXXXXXXX
             XXX
             XXX
```

PRINTERS

For the most part, letter-quality printers don't print graphics. Dot-matrix printers do print graphics. Another type of printer, called a plotter, produces finer-quality graphics than the dot-matrix. Plotters work well with geometric lines and shapes. They print your work on paper by using different-color pens.

High quality graphics like the ink-jet printer (sprays colored ink on the paper) or laser printer (actually burns paper with laser light) are more sophisticated but expensive.

The clearest, most colorful graphic images are produced by taking a picture directly from the computer screen using a graphics camera.



Computers designing computers. The design of this computerized robotic arm is being generated by a computer given instructions by a program that contains the technical specifications.

GRAPHICS USERS

Who uses computer-generated graphics? Everyone from firefighters to molecular physicists. In other words, people in many different professions benefit from computer-generated graphics. People find ingenious new ways every day to put computer graphics to work.

Did you ever wonder what makes your sneakers so comfortable to wear? What gives them all that bounce? The secret is in the design—and more often than not these days, good sneakers are designed by computer. Not just any old computer, but one that's compatible with special computer-aided design software, or CAD for short.

Sneaker designers, car and airplane manufacturers, architects, and artists are just a few of the people who benefit from using CAD. CAD enables designers to draw, change, and edit three-dimensional plans. The finished design can then be viewed from different angles. What's more, CAD can work with CAM, which is computer-aided manufacture, to direct the machines that actually make the product.

Unlike paint programs, CAD software stores not only the design but also information about it. Take a new sneaker de-

Copyright 1986
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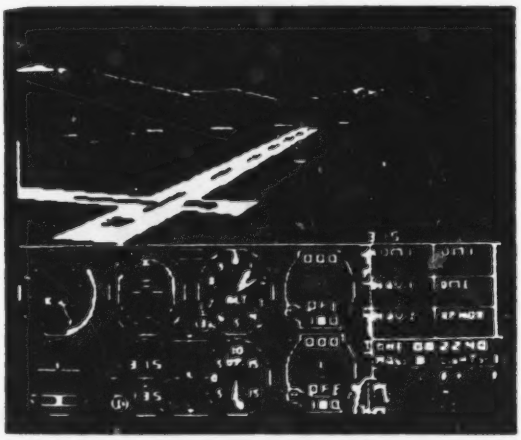


Future pilots can take off, fly, and land without leaving the ground using computerized simulators.

sign, for example. If you draw the sneaker on a regular paint system, it records the sketch. If you draw it on a CAD system, stored along with the sketch of the sneaker is information about sole thickness, the measurements and material of each piece of the sneaker, and how it should be constructed. If changes are necessary, they can easily be keyed in by the designer.

CAD's usefulness isn't limited to professional designing. A community in Maryland uses a CAD system to help firefighters. Blueprints and other important information about buildings are recorded in the system. In the past, this information was kept in paper files that were difficult to keep up-to-date. Now the information can be up-dated easily, and the computer, stationed on a fire truck, can be consulted as the firefighters rush to the fire.

ANIMATED PIXELS

Another area in which computers are saving people hours and hours of painstaking work is animation. Do you remember any of Disney's films like *Cinderella* and *Pinocchio*? Did you know that each frame of those films had to be created by hand? Animators had to draw a large number of sketches with gradual variations from one figure to the next.

That was before days of computer graphics. Now, using a technique called **key frame inbetweening**, the animator creates the first and last frame of a sequence and the computer provides the frames in between. To make Pinocchio's nose grow, an animator could now draw Pinocchio with a small nose, a medium-sized nose, and a very long nose, and the computer would fill in the motion in between.

Animated cartoons are a form of **simulation**. To *simulate* means "to pretend" or "to imitate." For example, the drawings of Cinderella dancing with the prince are meant to look like real people dancing. The same is true for other animated graphics. Today computers are used to simulate scenes that people cannot actually see but believe to exist. For instance, scientists use computer animation to simulate events that are either too small or too far away to capture on film—a hydrogen atom spinning on its axis or a spaceship floating by Saturn.

Another valuable use of computer-generated simulation becomes clear when you consider this scene: the pilot of a commercial jet airliner carrying several hundred passengers is preparing for a landing. The lights of the city come into view and the pilot spots the runway off in the distance. A mile from the runway, the plane encounters unexpected turbulence. The plane dips and then plunges

downward. The pilot fails to react quickly enough. The plane crashes.

This is part of a highly effective computer simulation that is used to train pilots. These simulations are similar to, though much more sophisticated than, simulation video games, with which you are probably familiar. First developed for the U.S. Air Force, flight simulators provide pilots with training at controls exactly like those on the planes they fly. The simulations look real and are generated with enough speed to create the appearance of real motion. This training could mean the difference between life and death in critical situations.

Perhaps even more amazing than computers that simulate life are those that watch and listen to the outer reaches of space. These computers work together with radio telescopes, which collect data from the radio spectrum. The computers take this information and translate it into a visual form that scientists can then interpret.

Closer to home are the satellites that orbit the earth collecting information about everything from trout migrations to mineral deposits to earthquakes. These satellites, scanning the land can look below the surface of the earth and pinpoint areas rich in oil or iron ore. A computer then pieces together the bits of data collected by the satellite to form a photograph of the entire area.

Even closer to home are computers that serve as the eyes of medicine. Like computers that create images of space and the earth, those used in medicine are revolutionizing how we see the human body. The days of two-dimensional x-rays have come and gone. Now, using computerized tomography, doctors can produce three-dimensional images of the inner body. In tomography, the computer takes many two-dimensional readings and combines them mathematically. It then manipulates this information to produce three-dimensional images. Often these images eliminate the need for exploratory surgery.

BASIC KEYWORDS USED IN GRAPHICS

GR	tells the computer to switch to the graphics mode.
COLOR	tells the computer which color to use.
VLIN	tells the computer to draw a verticical.
HLIN	tells the computer to draw a horizontal line.

GRAPHICS FOR YOUR COMPUTER

Each brand of computer must be programmed for graphics in its own way. The following sections list graphic information for the following computers:

APPLE

ATARI

COMMODORE

TRS-80

The printed information has been taken from Chapter 23 of The Random House Book of Computer Literacy by Ellen Richman, 1982.

What do you know about computer graphics? Match the following words to their definitions.

_____ 1. Tiny dots of light that make-up a picture on the screen.

_____ 2. Pictures, charts, graphs, maps, or other designs that are created on a computer.

_____ 3. Small, lap-sized chalkboard connected to the computer. Used to draw pictures on the computer's screen.

_____ 4. Very detailed drawings on the computer.

_____ 5. Printer which burns paper with laser light.

computer graphics
pixel
high resolution
graphics tablet
lazer printer

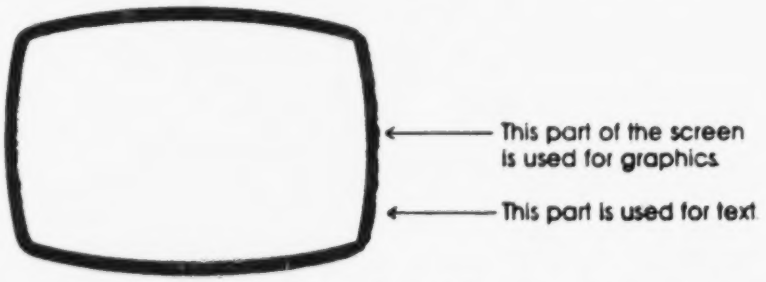
GR stands for **graphics**

Text refers to letters, numbers, and symbols

To draw designs on the Apple computer, you need to use a special statement in your programs:

```
10 GR
```

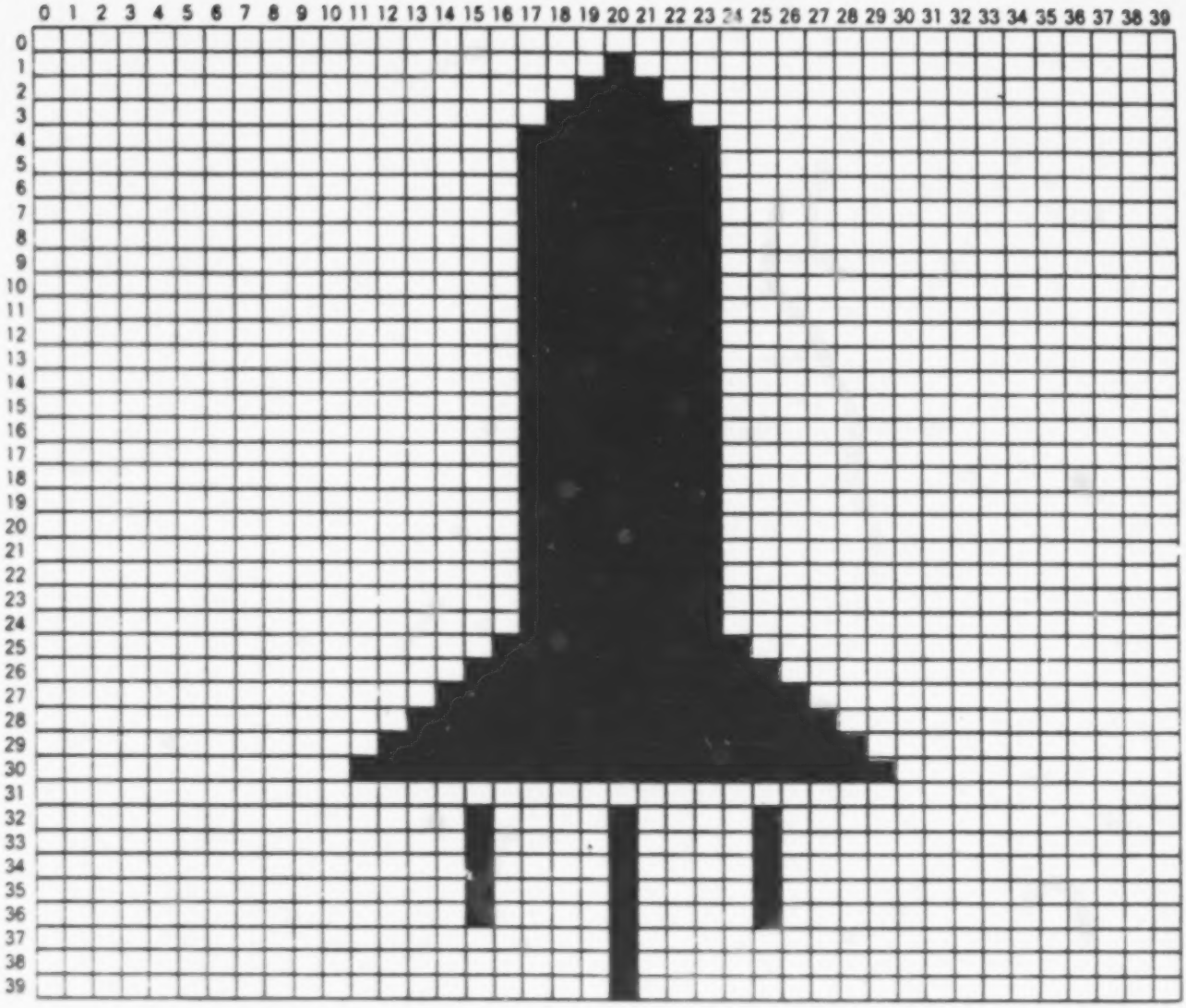
The GR statement changes the screen so that it is ready to display graphics. Only the four bottom lines of the screen can be used for text. The rest of the screen is reserved for the picture that is being programmed.



Now imagine that the top part of the computer screen is a graph with many small squares like the picture on the next page. The computer can be programmed to draw the spaceship on the screen by coloring in certain boxes to make a pattern.

Across

Graphics Sheet for the Apple Computer



The color black (0) is the background color of your screen. It will not show up unless it is used over another background color.

The number for green is 12.

In order to color in a box on the screen, you need to choose a color. Your choices are:

0 black	6 medium blue	11 pink
1 red	7 light blue	12 green
2 dark blue	8 brown	13 yellow
3 purple	9 orange	14 aqua
4 dark green	10 grey	15 white
5 grey		

Suppose you wanted to color the tip of the spaceship green. You would use these statements:

```
COLOR = 12
PLOT 20, 1
```

You can use only the numbers from 0 to 39 to locate a square.

PLOT lights up one square at location 20, 1. To find this location, start at the upper left-hand corner of the graph. Move *across* to column 20 and *down* to row 1. You should be at the tip of the spaceship.

You can color in any rectangle on the screen using PLOT and two numbers separated by a comma. The *first* number tells how far *across* the screen. The *second* number tells how far *down* the screen.

Now, choose the color red to fill in the spaceship.

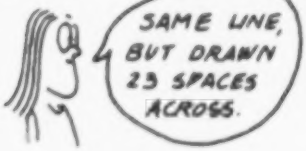
```
20 COLOR = 1
```

The Apple has two statements which allow you to draw horizontal (across) and vertical (down) lines. To draw the straight line on the left side of the spaceship, you can use the VLIN statement. VLIN stands for "vertical line."

```
30 VLIN 4, 24 AT 17
```

Find this line on the graph.

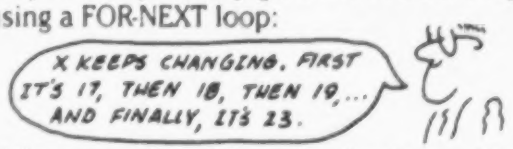
This statement tells the computer to draw a vertical line from row 4 to 24, at column 17. To draw the straight line on the right side of the spaceship you would type:




```
40 VLIN 4, 24 AT 23
```

As you can see, both lines go from 4 to 24. In fact, all the lines that make up the rectangular body of the spaceship go from 4 to 24. They can all be drawn at once using a FOR-NEXT loop:

```
30 FOR X = 17 TO 23
40 VLIN 4, 24 AT X
50 NEXT X
```



The top and bottom of the spaceship still need to be drawn. Use horizontal lines to draw the top section. The statement to draw a horizontal line is HLIN:

```
60 HLIN 18, 22 AT 3
70 HLIN 19, 21 AT 2
```

Find these lines on the graph.

Line 60 tells the computer to draw a line going across from 18 to 22 at row 3. Line 70 has the computer draw a horizontal line from 19 to 21 at row 2.

The top of the spaceship is one rectangle at location 20, 1. This statement (which you've seen before) colors the rectangle:

Remember, the location is 20 across and 1 down.

```
80 PLOT 20, 1
```

The bottom section of the ship is left for you to do in "Try These."

Now, choose another color for the letters "USA."

```
200 COLOR = 2
```

The main part of the ship will be red. When you color in the letters over the red, they will be dark blue.

At this point in the program, the computer will switch to dark blue. The letters can be programmed using VLIN, HLIN, and PLOT. This part of the program draws the letter "U":

```
210 VLIN 5, 9 AT 19   <-- Left side of the "U"
220 VLIN 5, 9 AT 21   <-- Right side of the "U"
230 PLOT 20, 9        <-- Bottom of the "U"
```

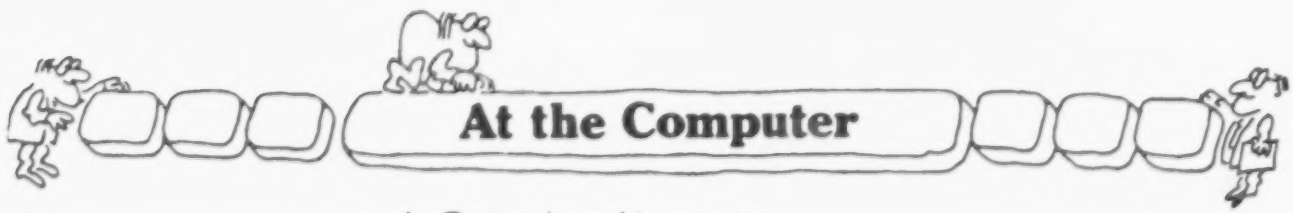
You will be asked to program the other letters in "Try These."

Don't forget to use the statements you used in exercises 1 and 2.

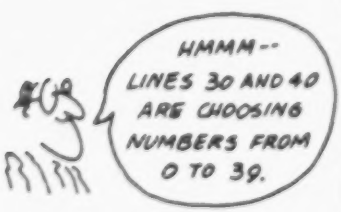
1. What is the statement that instructs the computer to clear the screen for graphics?
2. What statement would you use to draw in dark green?
3. Write a program to light up a square in each of the four corners of the screen.
4. Write a program to draw a horizontal line across the top of the screen and a vertical line down the middle of the screen. The two lines will look like a large letter "T." (Choose a color for the lines.)
5. Draw your initials on a graphics sheet. Then, write a program to draw them on the computer. If there are any curves, such as in the letter C, you will have to use straight or diagonal lines. Your letters can be any size and any color.

You may want to choose a different color for each initial.

6. Write a program to fill the entire graphics screen with a color of your choice. You can use either horizontal or vertical lines.
7. Write a program to draw the base of the spaceship on page 149.
8. Write a program for the flames coming out of the spaceship.
9. Write a program for the letters "S" and "A" in "USA."

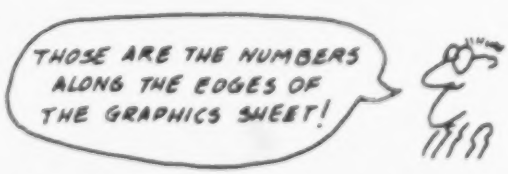


At the Computer



1. Type and run this program.

```
10 GR
20 COLOR = 3
30 H = INT(RND(1)*40)
40 V = INT(RND(1)*40)
50 PLOT H,V
60 GOTO 20
```



2. Stop the computer and list the program. You can't read all the lines because they roll off the top of the text screen. To change the whole screen back to text, type the command:

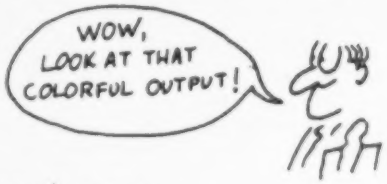
```
TEXT
```

You can clear the screen by typing HOME.

Now the color can be any number from 1 to 15.

The graphics screen will change to text. Now you can list your program. Change line 20 to:

```
20 COLOR = INT(RND(1)*15) + 1
```



Run the program again.

Type NEW

3. Draw a square that "moves" across the screen.

```
10 GR
20 FOR H = 0 TO 39
30 COLOR = 9
40 PLOT H,20
50 COLOR = 0
60 PLOT H,20
70 NEXT H
80 GOTO 20
```

As you can see, the square is not really moving. You are coloring in one square, then erasing it by coloring it black (the background color). Then, you are coloring in the next square, erasing it, and so on.

Type NEW

4. Draw a square that "moves" down the screen.

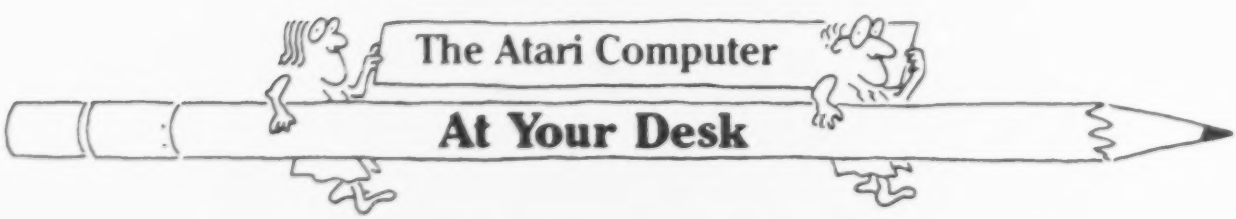
Type NEW

5. Type and run a program to draw your initials. Use your program from "Try These" exercise 5.

Don't use numbers larger than 39, or you'll get an error message!

Type NEW

6. Draw the entire spaceship shown on page 149. You have already done part of the work in "At Your Desk." Use whatever colors you like. You may wish to begin by programming a background color over the entire screen.



To draw pictures on the Atari computer, you need to use a special statement in your programs:

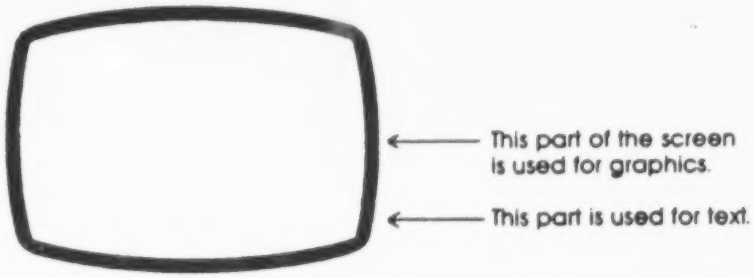
```
GRAPHICS 3 (or GR. 3)
```

On older models there may be fewer numbers that you can use.

There are eleven numbers, 0 to 10, that you can use with the GRAPHICS statement. For now, you will use only GRAPHICS 3.

The GRAPHICS 3 statement changes the screen so that it is ready to display graphics. Only the four bottom lines of the screen can be

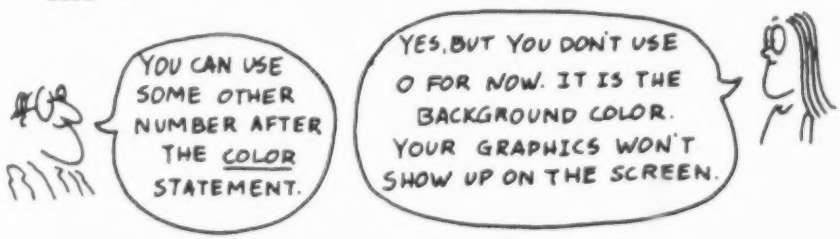
used for text. The rest of the screen is reserved for the picture that is being programmed.



Imagine that the top part of the screen is a graph with many small squares like the picture on the next page. The computer can be programmed to draw pictures on the graphics screen by coloring in a pattern of squares.

In order to see anything on the screen, you must tell the computer you want to use colors by typing:

```
COLOR 1
```


YOU CAN USE SOME OTHER NUMBER AFTER THE COLOR STATEMENT.
YES, BUT YOU DON'T USE 0 FOR NOW. IT IS THE BACKGROUND COLOR. YOUR GRAPHICS WON'T SHOW UP ON THE SCREEN.

The statement that is used for lighting up one square on the screen is PLOT. To plot a square, you have to identify it with two numbers like this:

```
PLOT 19, 13
```

This statement lights up one square at location 19, 13. To find this location, start at the upper left-hand corner of the graph. Move *across* to column 19 and *down* to row 13. You will see that this is the top of the letter "A" on the spaceship.

You can color in any square on the screen using PLOT and two numbers separated by a comma. The *first* number tells how far *across* the screen. The *second* number tells how far *down*.

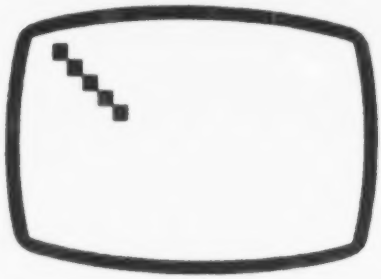
You might be thinking that it would take a very long time to "plot" squares to draw a picture. But the Atari computer uses a statement that can do a lot of work for you. Look at this program:

```
10 GR. 3 <-------- Set up the screen for graphics.
20 COLOR 1 <------ Use color.
30 PLOT 0, 0 <---- Draw a square at 0 across and 0 down.
40 DRAWTO 5, 5 <-- A new statement!
```

DRAWTO in line 40 means "draw a line to." So, the computer will plot a square at 0, 0 and then draw a line from that position to position 5, 5.

Find these squares on the graph.

The output is a diagonal line like this:



Here's a program for part of the spaceship colored in on the graph. It uses COLOR, PLOT, and DRAWTO:

```
10 GR. 3
20 COLOR 1
30 PLOT 17, 2 DRAWTO 17, 13
40 PLOT 18, 1 DRAWTO 18, 13
50 PLOT 19, 0 DRAWTO 19, 13
60 PLOT 20, 1 DRAWTO 20, 13
70 PLOT 21, 2 DRAWTO 21, 13
80 PLOT 16, 14 DRAWTO 22, 14
90 PLOT 15, 15 DRAWTO 23, 15
100 PLOT 14, 16 DRAWTO 24, 16
```

These lines draw the "tall" part of the spaceship.

These lines draw the bottom of the spaceship.

Find these squares and lines on the graph.

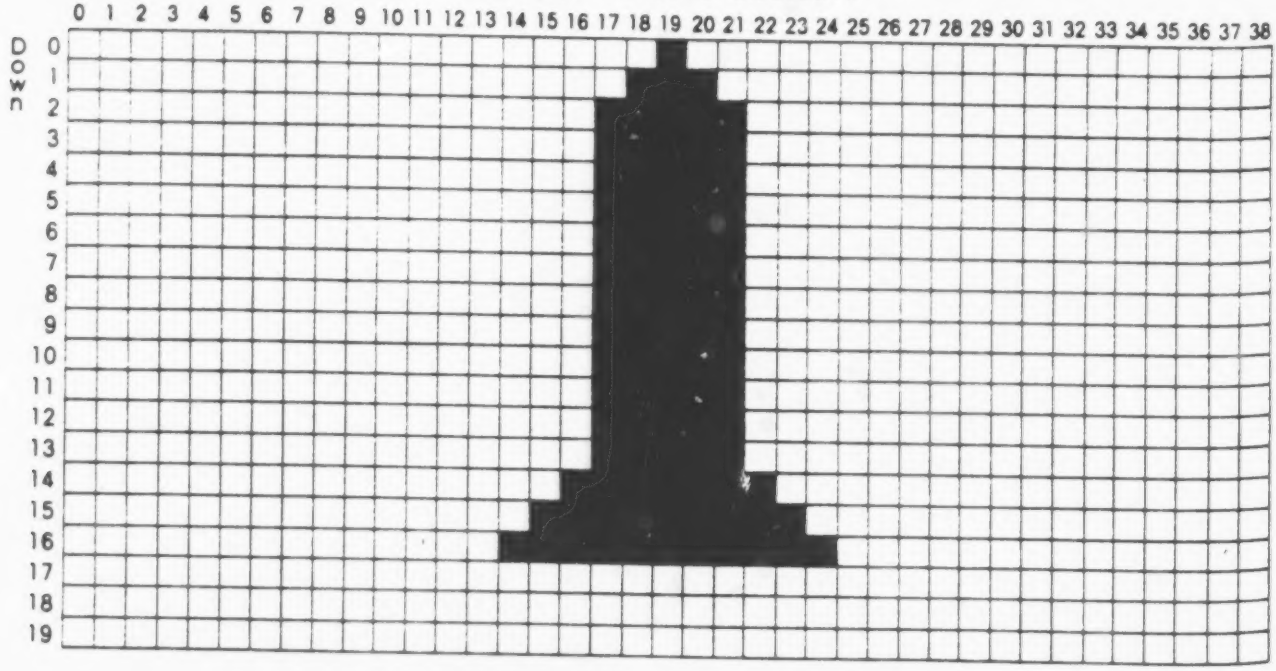
Remember, use a colon when you have two statements on one line.

If you don't tell the computer what colors to use, it will choose the colors for you. It will choose black for the graphics background, blue for the text background, and orange for the graphics squares. To choose your own colors, you must use a new statement—SETCOLOR—along with COLOR.

Across

Atari Graphics Sheet for GRAPHICS 3

Down



SETCOLOR means you are going to "set" or choose a color. SETCOLOR is followed by three numbers such as these:

```
SETCOLOR 0, 12, 2
```

Let's look at one number at a time. The first number chooses *what* you want to color. It is called the color register. In GRAPHICS 3, you can use the numbers 0, 1, 2, or 4:

You can't use the number 3 when you are in GRAPHICS 3.

0 and 1 mean choose a color for the graphics squares.
2 means choose a color for the text background.
4 means choose a color for the graphics background.

The color register in SETCOLOR 0, 12, 2 is 0. It tells the computer you will be choosing a color for the graphics squares.

The second number chooses the color. You can use the numbers 0-15:

0 grey	6 lavender	11 green-blue
1 gold	7 blue	12 green
2 orange	8 blue	13 yellow-green
3 red-orange	9 light blue	14 orange-green
4 pink	10 turquoise	15 light orange
5 purple		

The second number in the SETCOLOR statement above is 12, so the statement tells the computer to choose the color green. So far, the SETCOLOR statement means the computer will color graphics squares green.

Number 10 causes a blank screen. Don't use it!

The third number chooses the brightness of the color. You can use the numbers 0 to 14. Zero is the brightest; fourteen is the darkest. The third number in the SETCOLOR statement above is 2, so the computer will draw very bright green squares.

SETCOLOR only *chooses* what you want to color (the color register, the color, and the brightness). To *put* the color on the screen you need to use the COLOR statement. COLOR is followed by 0, 1, 2, or 3. The number is *always* one more than the color register in SETCOLOR. (If the register number in SETCOLOR is 4, then the COLOR number is 0.) Here are some examples:

The color register is the first number after SETCOLOR.

```
SETCOLOR 0, 12, 8
COLOR 1

SETCOLOR 1, 7, 8
COLOR 2

SETCOLOR 2, 15, 8
COLOR 3

SETCOLOR 4, 2, 8
COLOR 0
```

Look back at page 148.

Now, you can choose colors for the spaceship program. These lines replace old lines 10 and 20.

```
10 GR. 3
12 SETCOLOR 4, 9, 14
14 COLOR 0
16 SETCOLOR 0, 0, 12
18 COLOR 1
```

Line 12 chooses light blue for the graphics background. Line 14 puts the color on the screen. Line 16 chooses grey for the graphics squares which make up the spaceship. Line 18 puts the color on the screen.

Now, you're ready to draw the letter "U." First, you have to change the color. If you don't, the color will be the same as the spaceship, and the letter "U" won't show up.

You will be asked to program the other letters in "Try These."

```
100 SETCOLOR 1, 3, 2
110 COLOR 2
120 PLOT 18, 2: DRAWTO 18, 5
130 PLOT 20, 2: DRAWTO 20, 5
140 PLOT 19, 5
```

Choose a color and brightness for the graphics squares. Put the color on the screen. Draw the "U."

Line 100 is very important. Remember, you can use 0 or 1 for the color register to choose a color and brightness for graphics squares. You already used 0 in line 16. If you use 0 again, the computer would change *all* the graphics squares to the new color. Since you want the letter "U" to be a different color, you must use a different color register (1) for those squares.

The four color registers, 0, 1, 2, and 4, allow you to have four different colors on the screen at one time. In the spaceship program, the graphics squares (registers 0 and 1) are grey and red-orange. The graphics background (register 4) is light blue. No color was chosen for the text background, so it is automatically blue.

Your Atari computer manual has charts to show you which color registers to use. You can also experiment.

So far you have seen only GRAPHICS 3. GRAPHICS 4, 5, 6, 7, 8, 9, and 10 work just like GRAPHICS 3, but they have more (and smaller) squares on the graphics screen. Some of the graphics numbers use other color registers than the ones that are used in GRAPHICS 3.

You can also use GR. 0 to clear the screen.

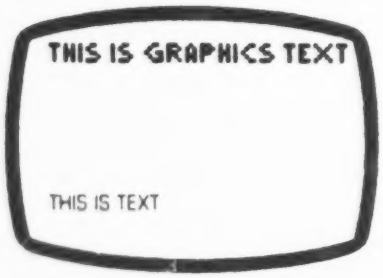
GRAPHICS 0 is used for text. The computer is automatically set in GR. 0 when you turn it on. You were using GRAPHICS 0 when you typed the programs in the other chapters in this book.

GRAPHICS 1 and GRAPHICS 2 are special. They allow you to write **graphics text**. Graphics text is letters, numbers, and symbols that are displayed on the graphics screen. They are made up of small graphics squares. Here is a program that prints graphics text in GRAPHICS 1 and regular text on the text screen.

A COLOR statement is not necessary with GR. 1 or GR. 2.

```
10 GR. 1
20 PRINT "THIS IS TEXT"
30 PRINT #6; "THIS IS GRAPHICS TEXT"
```

In line 30, PRINT #6; tells the computer to print in graphics text. The output of the program looks like this:



GRAPHICS 2 is the same, only the letters are taller.

1. Here are three graphics statements: GR. 0, GR. 1, GR. 3.
   - **a.** Which statement is used for graphics screen display?
   - **b.** Which statement is used for graphics text?
   - **c.** Which statement is used for text only?
2. Name the statement that:
   - **a.** chooses a color register, a color, and a brightness.
   - **b.** tells the computer to draw with the chosen color and brightness.
   - **c.** draws one square.
   - **d.** draw a line.
3. The program below draws one square near the middle of the screen:

```
10 GR. 3
20 SETCOLOR
30 COLOR
40 SETCOLOR
50 COLOR
60 PLOT 19, 10
```

   - **a.** Write lines 20 and 30 to make the background color light orange. (Choose any brightness you want.)
   - **b.** Write lines 40 and 50 to make the square blue. (Any brightness will be all right.)
4. Write a program to light up a square in each of the four corners of the screen.

Choose a color for the graphics squares.

Continued

Choose a color for the graphics squares.

There are only two numbers you can use for graphics text.

5. Write a program to draw a line across the top and a line down the right side of the screen.

6. Using graphics text, write a program to print your name on the graphics screen. (Remember, PRINT #6; is the statement for graphics text.)

7. Write a program to draw the letters "S" and "A" on the spaceship.

At the Computer

1. Type and run this program. Use your name in line 120.

```
10 GR. 3
30 COLOR 1
70 PLOT 0,0
120 PRINT "GRAPHICS BY MARK MORRIS"
```

You should see an orange square in the upper left corner of the screen. The graphics background is black, and the text background at the bottom of the screen is blue. GRAPHICS BY (your name) appears in the text screen.

2. Add another statement to line 70. If you start typing now, your new line 70 will be displayed in the text portion of the screen. Type:

```
70 PLOT 0,0 DRAWTO 19,19
```

Try to LIST your program. Part of it rolls off the top of the text screen. Clear the screen of graphics by typing GR. 0 (no line number). Now, you can list your program on the regular text screen. Run the program. You should see a diagonal line.

Don't forget the colon.

You can also press SYSTEM RESET.

3. Type GR. 0 and list the program. Add this line:

```
20 SETCOLOR 4,5,8
```

Change line 30 to:

```
30 COLOR 0
```

RUN the program. You have changed the background color of the graphics screen. Retype line 20 several times, changing the color and brightness of the line. (But leave the color register, the first number, 4. We want to change only the background color.)

4. Add these lines:

```
100 SETCOLOR 2, 14, 8
110 COLOR 3
```

You are changing the color of the text background. Change the numbers for color and brightness several times.

5. Change the color of the diagonal line. Add these lines to your program:

```
50 SETCOLOR 0, 12, 2
60 COLOR 1
```

Run the program.

6. You can use a FOR-NEXT loop to change the line to all the colors. Add these lines:

```
40 FOR C = 0 TO 15
90 NEXT C
```

Change line 50 to:

```
50 SETCOLOR 0, C, 8
```

RUN the program and watch the colors change. Does it run too fast? Put in a pause after you draw the line. Add:

```
80 FOR P = 1 TO 200 NEXT P
```

Run the program again.

Type NEW

7. Draw a square that "moves" across the screen.

```
10 GR. 3
20 FOR A = 0 TO 38
30 SETCOLOR 0, 4, 6
40 COLOR 1
50 PLOT A, 10
60 COLOR 0 <-------- COLOR 0 without SETCOLOR changes
70 PLOT A, 10        the graphics squares to the background
80 NEXT A            color, "erasing" them.
```

Run the program. Of course, nothing is really moving. The computer PLOTted a square, "erased" it, then PLOTted a square in the next space, "erased" it, and so on.

8. Draw a square that "moves" down the screen.

9. Draw the entire spaceship shown on the graphics sheet. Part of the program appears in "At Your Desk." You have written the rest of the program in "Try These." Choose your own colors for the background, the spaceship, and the letters. Print a message in the text window, such as PROGRAMMED BY (your name).

Imagine that the computer screen is a graph with many small squares like the picture on the next page. The Commodore computer can be programmed to draw pictures by filling in certain squares with graphics characters. Graphics characters are symbols, or little pictures. You can find them on the fronts of the keys on the keyboard. To print these characters on the screen, you must use the SHIFT key. For example, to print a diamond, you would hold down the SHIFT key and press Z.

Suppose you wanted to fill in one graphics square with a circle like the one in the upper left corner of the graphics sheet. First, you must be sure the cursor is at the top of the screen. To do this, you can clear the screen by using this statement:

```
10 PRINT "□"
```

An **inverse heart** has the colors reversed. A black heart appears on a green background.

To type the heart, you press the CLR key as you are typing. You will see an **inverse heart** symbol appear on the screen.

You have already used the CLR key to clear the screen. By typing it in a PRINT statement as part of your program, you instruct the computer to clear the screen when you run the program.

The second line of the program is:

```
20 PRINT "●"
```

← To type the circle, you press SHIFT and Q.

Find the circle on the graph.

When you run the program, the circle appears at the beginning of the first line.

Look at the graph. The numbers go across from 0 to 39 and down from 1 to 25. Suppose you wanted to put the circle in the upper right-hand corner of the screen. You could put 39 spaces inside the quotes.

```
20 PRINT "                                      ●"
```

40th space—you have to count the zero.

You don't have to count spaces.

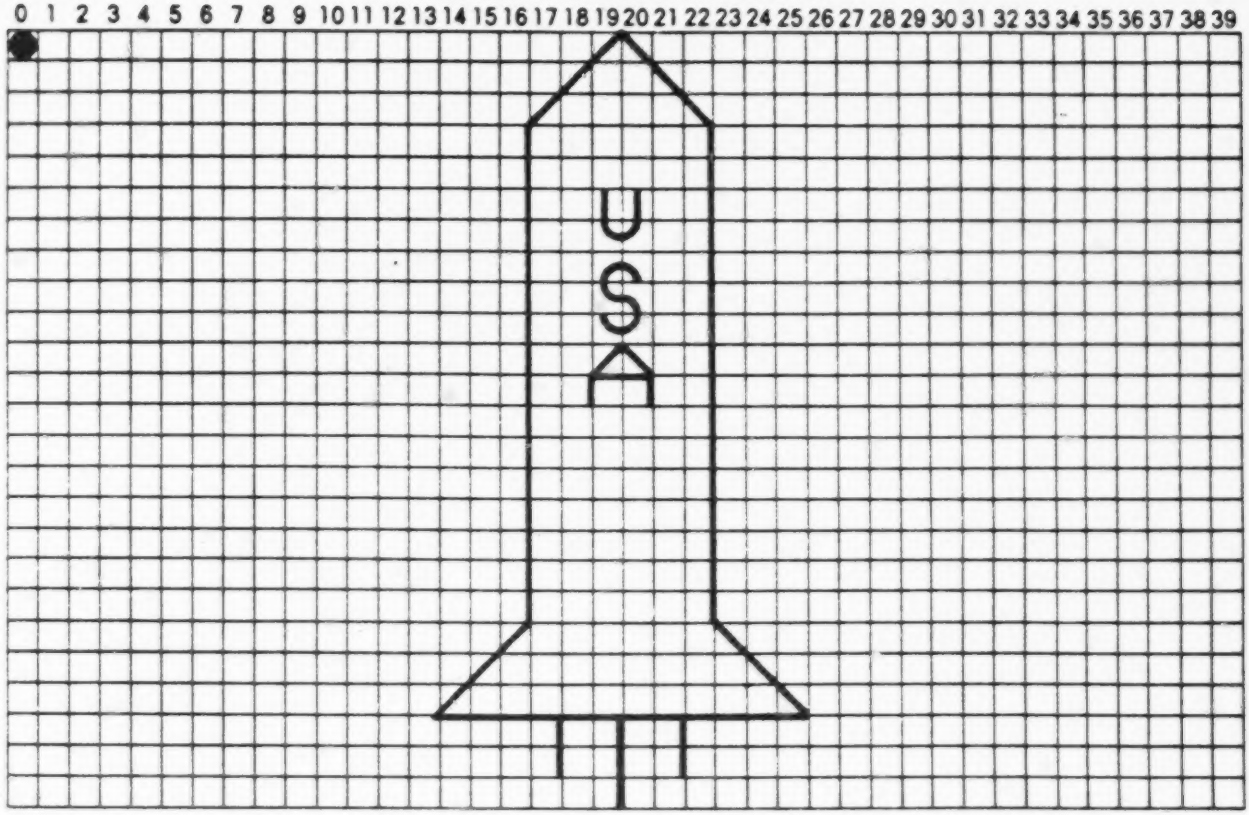
But, there is a shortcut that uses a new statement—TAB. This statement has the computer print the circle at box 39:

```
20 PRINT TAB(39) "●"
```

Across

Graphics Sheet for the PET Computer

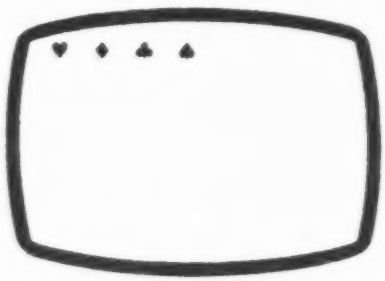
Down



The heart in line 20 is the regular heart. It is typed by pressing SHIFT and S.

Look at the program and the output below. The program clears the screen and uses TAB statements to print symbols.

```
10 PRINT "■"
20 PRINT TAB(5) "♥" TAB(10) "♦" TAB(15) "♣" TAB(20) "♠"
```



Suppose you want to print a graphics character farther down the screen. You can use the PRINT statement to do that. Using PRINT alone tells the computer to print a blank line. This program tells the computer to print a diamond 5 lines down, at box 9 (across):

```
10 PRINT "■"
20 PRINT PRINT PRINT PRINT PRINT <---- 4 lines of blanks
30 PRINT TAB(9) "♦"
```

Find this box on the graph.

There are 25 lines on the screen, so if you wanted a graphics character at the bottom of the screen, you would have to type 24 blank lines or 24 PRINTs. But you know a shortcut to take care of that—the FOR-NEXT loop:

```
10 PRINT "■"
20 FOR X = 1 TO 24
30 PRINT
40 NEXT X
50 PRINT TAB(20) "■"
```

24 lines of blanks

Here is the output:

You can put together as many graphics characters as you want, to make a design. Here is a program to draw the top of the spaceship on the graph:

```
10 PRINT "■"
20 PRINT TAB(19) "/\"
30 PRINT TAB(18) "/  \"
40 PRINT TAB(17) "/    \"
```

Look at the graph to find the output of lines 20, 30, and 40.

To draw the body of the spaceship you can use a FOR-NEXT loop. This part of the program draws two lines going down from 4 to 19:

```
50 FOR X = 4 TO 19
60 PRINT TAB(17) "|      |"
70 NEXT X
```

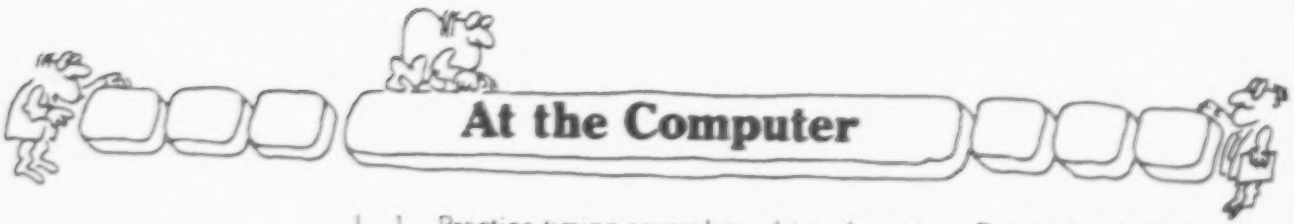
Since there are 16 lines of the pattern, you could also type: 50 FOR X = 1 TO 16

You will be asked to program the bottom of the spaceship in "Try These" and the letters "USA" in "At the Computer."

1. When you type a graphics character, what additional key must you press?
2. Draw a design on a graphics sheet using any of the graphics characters you saw in this section. Write a program to draw the design on the screen.
3. Continue the spaceship program so it draws the bottom of the spaceship. Start with line 80.

Use TABs and PRINTs to help you put the designs in the right positions.

4. Continue the spaceship so it draws the flames coming out of the bottom of the spaceship.



At the Computer

1. Practice typing several graphics characters. Remember to hold down the SHIFT key. You can also press the SHIFT/LOCK key until it clicks. It will keep the keyboard in the shift position. To get out of the shift position, press the SHIFT/LOCK key again.

2. The PET computer will draw a graphics character wherever the cursor is. It is important to know how to move the cursor around when you write a program. First, practice clearing the screen. Type:

```
10 PRINT "■"
```

Press CLR to get the heart. Don't forget the quotes.

It is good practice to clear the screen at the beginning of every program.

RUN the program. Notice that the screen is cleared, and the cursor is in the top left-hand corner.

3. Now type:

```
20 PRINT : PRINT : PRINT
30 PRINT "○"
```

← Type SHIFT-W

Remember a colon lets you put more than one statement on a line.

Run the program. You will see three blank lines and the circle on the fourth line.

4. There is another way to move the cursor down. You can use a PRINT statement, quotes, and the CRSR▪ key. Pressing the CRSR▪ key (inside the quotes) puts an inverse Q on the screen. Type these lines:

```
40 PRINT "■■■"
50 PRINT ●
```

Remember an **inverse** character is black on a green background.

Run the program. You will see three blank lines, then a solid circle.

5. Now print a diamond *above* the circle. This time, you must use the CRSR↑ key in quotes. Pressing the CRSR↑ key (inside the quotes) puts an inverse dot on the screen. Type:

```
60 PRINT "■ ●"
```

← This is the graphics diamond (SHIFT-Z).
↑ This is the CRSR ↑ key.

You can combine symbols in one statement.

Now run the program.

Remember the inverse ◘ is typed by pressing the CRSR ▪ key

6. You have already learned how to move the cursor to the right by using a TAB statement. Type:

```
70 PRINT "■■■■■" TAB(10)"▲"
```

Line 70 will move the cursor down 5 lines from the diamond and print the spade on the sixth line, at 10 across.

7. There is one more important cursor movement—moving the cursor to the **home** position. The home position is the upper left-hand corner of the screen. To move the cursor to the home position and print a heart on the screen, type this line:

```
80 PRINT "■▲"
```

To get the inverse S, press the HOME key (inside the quotes) as you type. Now run the program.

8. LIST the program from #2. It should look like this:

```
10 PRINT "◘"
20 PRINT: PRINT: PRINT
30 PRINT "□"
40 PRINT "■■■"
50 PRINT "●"
60 PRINT "□♦"
70 PRINT "■■■■■" TAB(10)"▲"
80 PRINT "■▲"
```

After you RUN the program, you'll see the READY message on the screen. When you create a picture with graphics characters, the READY message might get in the way of your picture. So eliminate the READY message by making your program *never end*. To do this, type:

```
90 GOTO 90
```

RUN the program. Line 90 keeps the computer busy. The program will never end, and the READY message will not appear. Use a one-line infinite loop at the end of all your graphics programs.

Remember to press STOP when you want to start typing again.

9. Draw your initials on a graphics sheet. You may wish to use thin lines, thick lines, curved lines, blocks, triangles, etc. Then, write a program to draw the initials on the screen.

Type NEW

10. Program the entire spaceship on page 161, but without the letters "USA."

Type NEW

11. Now add the letters "USA." Use graphics characters to make up the letters. Hint: You may want to use HOME, CRSR ▪, and CRSR ▪ in this program.

Type NEW

248

Imagine that the computer screen is divided into many small boxes or rectangles like the graphics sheet on the next page. The computer can be programmed to draw a picture by lighting up certain rectangles to make a pattern. For example, a spaceship is represented by lighting up the rectangles shaded in on the graphics sheet.

The statement that is used for lighting up one rectangle on the screen is SET. This instruction lights up the rectangle that is the tip of the spaceship:

```
SET (62, 1)
```

You must use parentheses and a comma.

To find the rectangle at location (62, 1), start at the upper left-hand corner of the graph. Move across to the column marked 62 and down to the row marked 1. You should be at the tip of the spaceship.

The first number in parentheses tells you how far *across* the screen. The *second* number tells you how far *down* the screen. This statement lights up the tip of the "A." Find it on the graph.

```
SET (62, 20)
     ↑   ↑
Across  Down
```

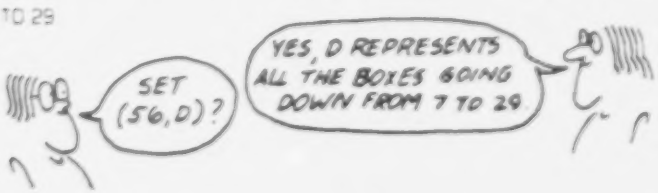
If you use numbers that are too large, you will get an error message.

You can light up any rectangle on the screen by using SET. But, you can use only the numbers on the graph. You can use numbers from 0 to 127 for the first number and numbers from 0 to 47 for the second number. For example, this statement lights up the rectangle in the upper right-hand corner of the screen:

```
SET (127, 0)
```

You might be thinking that it would take a very long time to light all the rectangles to show the spaceship. You have learned other statements that can do a lot of the work for you. Look at this program:

```
10 FOR D = 7 TO 29
20 SET (56, D)
30 NEXT D
```



Find these rectangles on the graph.

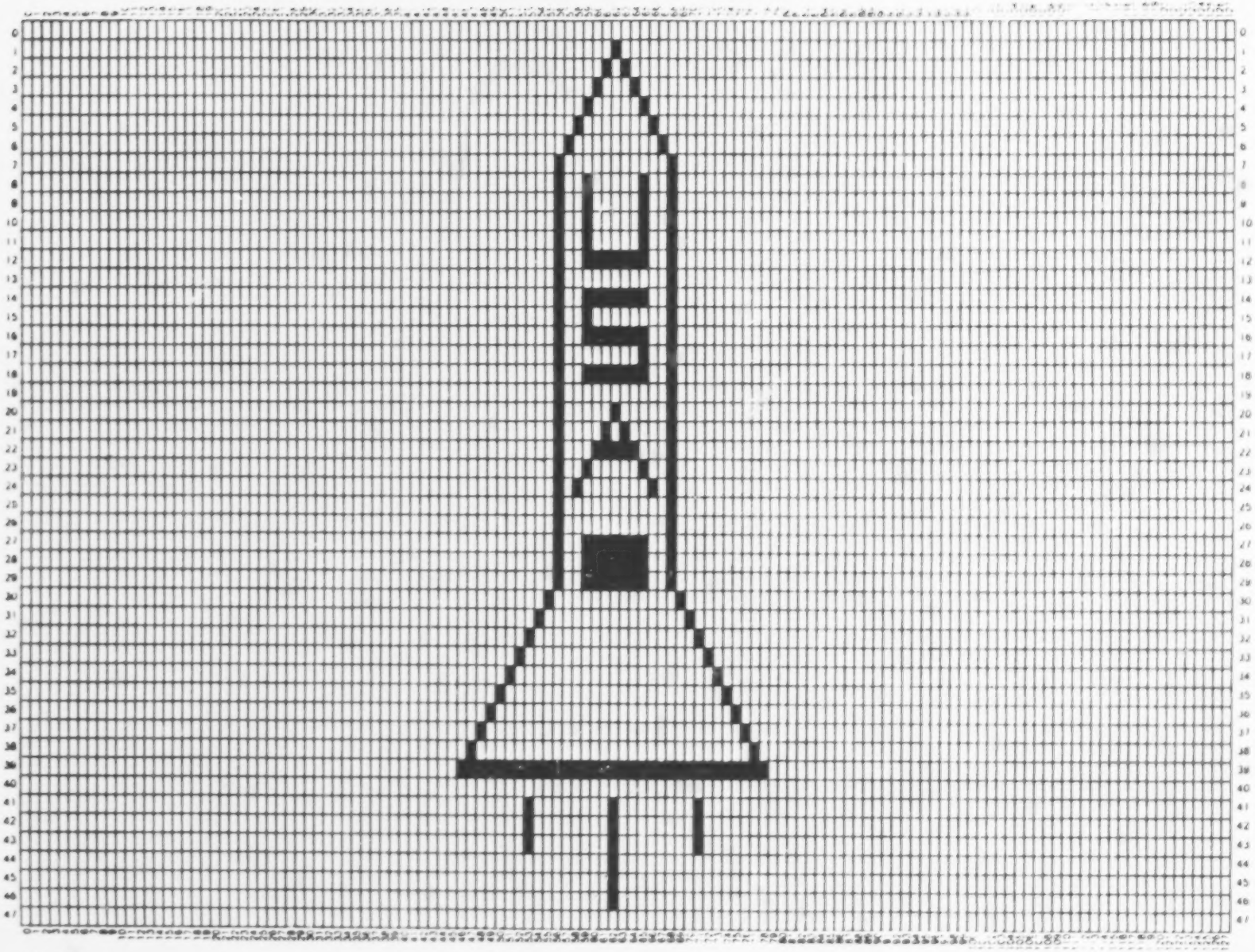
This FOR-NEXT loop lets you light all the rectangles down the side of the spaceship with only one SET statement. These rectangles will light up, forming a vertical line: (56, 7), (56, 8), (56, 9), . . . (56, 29).

Across

Graphics Sheet for the TRS-80

250

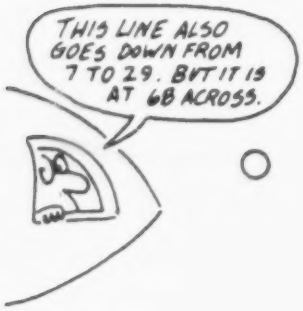
Down



Across

277

278



The other side of the spaceship can be programmed the same way.

```
10 FOR D = 7 TO 29
20 SET (68, D)
30 NEXT D
```

Since both sides of the spaceship are the same length, you can use one FOR-NEXT loop to draw them. Instead of having two programs, you can use this program to draw both sides of the ship.

```
10 FOR D = 7 TO 29
20 SET (56, D)
25 SET (68, D)
30 NEXT D
```

The line across the bottom of the spaceship can also be drawn with a FOR-NEXT loop.

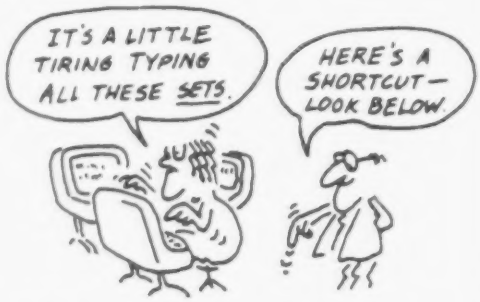
```
40 FOR A = 46 TO 78
50 SET (A, 39)
60 NEXT A
```

This loop draws a line that goes across from 46 to 78. It is located at row 39 (down). The rectangles that make up this line are: (46, 39), (47, 39), (48, 39), . . . (78, 39).

Find these rectangles on the graph.

The diagonal lines on the top of the spaceship can be drawn by SETting each individual rectangle.

```
70 SET (62, 1)
80 SET (61, 2)
90 SET (60, 3)
100 SET (59, 4)
110 SET (58, 5)
120 SET (57, 6)
130 SET (63, 2)
140 SET (64, 3)
150 SET (65, 4)
160 SET (66, 5)
170 SET (67, 6)
```



There is a way to avoid typing the SETs and parentheses. You can put all the numbers into a DATA statement:

```
70 DATA 62, 1, 61, 2, 60, 3, 59, 4, 58, 5, 57, 6, 63, 2, 64, 3, 65, 4, 66, 5, 67, 6, -1, -1
```

A DATA statement can go anywhere in the program.

Then you can READ the DATA, and SET what you READ.

```
80 READ A, D
90 IF A = -1 THEN GOTO 120 <---- The data -1, -1 are "dummy" data.
100 SET (A, D)
110 GOTO 80
120 <---------------------- The program continues.
```

Line 100 lights up rectangles (62, 1), (61, 2), (60, 3), etc.

To fill in the box under USA you could draw three horizontal (across) lines:

```
120 FOR A = 59 TO 66
130 SET (A, 27)
140 SET (A, 28)
150 SET (A, 29)
160 NEXT A
```

Find these lines on the graph.

Or, you could use two FOR-NEXT loops. Read this part of the program carefully.

```
120 FOR D = 27 TO 29
130 FOR A = 59 TO 66
140 SET (A, D)
150 NEXT A
160 NEXT D
```

First, 27 is stored in D, and 59 is stored in A. The rectangle at (59, 27) lights up. Then, the next number, 60, is stored in A, and the rectangle at (60, 27) lights up. The program continues in this loop until all the numbers for A are used up. The output is a horizontal line at row 27. Then, the computer goes to the next D, which is 28. The program loops through all the numbers for A. The output is a horizontal line at row 28. Then, the computer goes to the next D, which is 29. The output is a horizontal line at row 29.

In FOR-NEXT loops, the inside loop is done first.

When two FOR-NEXT loops are used together, they are called **nested** loops. In the program above, the A loop is nested inside the D loop. In the program below, the D loop is nested in the A loop. This program fills in the same box under USA on the spaceship. It draws 8 short vertical (down) lines from columns 59 to 66.

The D loop is nested inside the A loop.

```
120 FOR A = 59 TO 66
130 FOR D = 27 TO 29
140 SET (A, D)
150 NEXT D
160 NEXT A
```

One loop must be completely inside the other loop.

Use a graphics sheet to help you figure this out.

1. Draw the output on a graphics sheet.

```
10 FOR A = 40 TO 90
20 SET (A, 25)
30 NEXT A
```

2. Describe the output for this program.

```
10 FOR A = 0 TO 127
20 FOR D = 0 TO 47
30 SET (A, D)
40 NEXT D
50 NEXT A
```

3. Write a program to draw USA as it appears on the spaceship. Use FOR-NEXT loops to draw the straight lines.

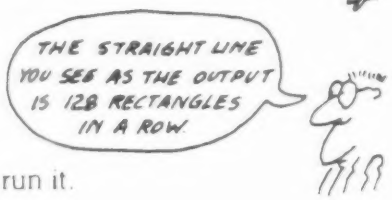
4. Draw your initials on a graphics sheet. If there are any curves, such as in the letter C, you will have to draw them using straight or diagonal lines. Your letters can be any size, large or small. Then, write a program to draw the initials on the computer screen.

Don't use numbers larger than 127 across, or larger than 47 down, or you'll get an FC ERROR message. FC stands for "illegal function call." It means you used a number that was too large.

At the Computer

1. Type and run this program.

```
10 FOR A = 0 TO 127
20 SET (A, 24)
30 NEXT A
```



2. Add this line to your program and run it.

```
5 CLS
```

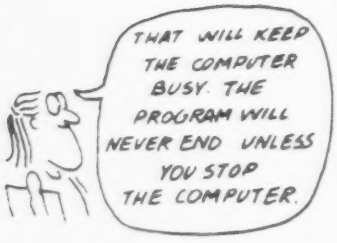
CLS means "clear screen." This line tells the computer to clear the program from the screen. The program is cleared before the output is printed, leaving a clear screen for your computer picture.

3. Change a statement in your program so the computer draws the line at the bottom of the screen.

4. Change a statement in your program so the computer draws the line at the top of the screen. After you run the program, look at what happened to the beginning of the line. The READY message covered it up! The READY message appears when the computer reaches the end of a program. To avoid having part of your graphics blocked out, the program must never end. So, add this statement to your program:

```
1000 GOTO 1000
```

You don't have to use line number 1000. Any line number will do, but it must be the last line in your program.



5. Change a statement in your program so the computer draws a dotted line across the screen. (Hint: Light up every *other* rectangle.)

Type NEW

6. Write a program to draw your initials. You can use your program from "Try These" exercise 2.

Type NEW

7. Light up rectangles randomly on the screen. Part of the program is done for you. Complete lines 20, 30, 40, and 50.

This program has an infinite loop. You'll need to stop the computer.

```
10 CLS
20 A = RND(  )
30 D = RND(  )
40 SET (  ,  )
50 GOTO
```

Pick the highest number you want for across and down.

Type NEW.

RESET is a statement that turns off the lighted rectangle.

Type NEW, or change some lines from the previous program.

8. Draw a dot that "moves" across the screen:

```
10 CLS
20 FOR A = 0 TO 127
30 SET (A, 24)
40 RESET (A, 24)
50 NEXT A
60 GOTO 20
```

   The dot is not really moving. You are lighting up one rectangle, turning it off, then lighting up the next one, turning it off, and so on.

9. Draw a dot that "moves" *down* the screen.

10. Write a program for the spaceship as it is shown on the graphics sheet. Parts of it have been done for you in "At Your Desk." Also, you programmed the letters in "Try These."

Enter this program and run it. Draw the picture that you see on your screen. Describe how it moves.

```
5 TEXT : GR
10 FOR L = 19 TO 0 STEP - 1
20 FOR A = 0 TO 15
30 READ B,C,D
40 GOSUB 1000
50 NEXT A : RESTORE
60 NEXT L : GOTO 5
70 END
1000 COLOR= 0: HLIN 11,29 AT A + L + 1
1010 COLOR= D: HLIN B,C AT A + L
1020 RETURN
2000 COLOR= D: VLIN B + L, C + L AT A
2010 RETURN
5000 DATA 18,22,1,17,23,2,16,24,3
5010 DATA 15,25,4,14,26,5,13,27,6
5020 DATA 13,27,6,14,26,5,15,25,4
5030 DATA 16,24,3,17,23,2,18,22,1
5040 DATA 20,20,1,20,20,1,20,20,1
5050 DATA 20,20,1,19,21,7
```

Description: _____

_____

_____

Here are some BASIC keywords used in the program.

GR instructs the computer to use most of the screen for graphics and only the bottom four lines for text.

READ...DATA The READ statement in line 30 reads three pieces of information from the DATA statements and puts them into variables B, C, and D.

HLIN draws a horizontal line. For example, HLIN 3, 14 AT 10 draws a horizontal line on row 10 going from position 3 to position 14.

VLIN draws a vertical line. For example, VLIN 4, 20 AT 10 draws a vertical line in column 10 from position 4 to position 20.

COLOR tells the computer which color you want to use.

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Enter this program and run it. Draw the picture that you see on your screen. Describe how it moves.

```
10 FOR L = 0 TO 17
20 READ A,B,C
30 GOSUB 1000
40 NEXT
50 RESTORE
60 PRINT:PRINT:PRINT
70 GOTO 10
80 END
1000 PRINT SPC(A);CHR$(C);
1010 FOR X = 1 TO B
1020 PRINT CHR$(113);
1030 NEXT X:PRINT:RETURN
5000 DATA 18,5,149,17,7,150
5010 DATA 16,9,153,15,11,158
5020 DATA 14,13,129,13,15,158
5030 DATA 13,15,152,14,13,159
5040 DATA 15,11,153,16,9,158
5050 DATA 17,7,129,18,5,158
5060 DATA 20,1,144,20,1,144
5070 DATA 20,1,144,20,1,144
5080 DATA 20,1,144,20,1,144
```

Description: _____

_____

Here are some BASIC keywords used in the program.

READ...DATA The READ statement at line 20 reads three pieces of information from the DATA statements and puts them into variables A, B, and C.

SPC The SPC function works with the PRINT statement and instructs the computer to print a number of blank spaces equal to the number stored in variable A.

**CHR$** The CHR$ function works with the PRINT statement and instructs the computer to print the character associated with the number in the parentheses. The CHR$ function in line 1000 changes the color in which the Commodore prints things. The CHR$ function in line 1020 instructs the computer to print character number 113.

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WORKSHEET 61 IBM PCjr Graphics

Enter this program and run it. Draw the picture that you see on your screen. Describe how it moves.

```
5 WIDTH 40
10 FOR A = 0 TO 15
20 READ B,C,D
30 GOSUB 1000
40 NEXT:RESTORE
50 PRINT:PRINT:GOTO 10
60 END
1000 PRINT TAB(B);:COLOR D,0:PRINT STRING$(C,219)
1010 COLOR 7,0:RETURN
5000 DATA 18,5,1,17,7,2
5010 DATA 16,9,3,15,11,4
5020 DATA 14,13,5,13,15,6
5030 DATA 13,15,6,14,13,5
5040 DATA 15,11,4,16,9,3
5050 DATA 17,7,2,18,5,1
5060 DATA 20,1,4,20,1,4
5070 DATA 20,1,4,20,1,4
```

Description: _____

_____

Here are some BASIC keywords used in the program.

WIDTH sets the screen width. You could set the width to 20, 40, or 80 characters wide.

READ...DATA The READ statement in Line 20 reads three pieces of information from the DATA statements and puts them into variables B, C, and D.

COLOR The COLOR statement in line 1000 will cause the next character to be printed in the color contained in variable "D". The zero used in the COLOR statement sets the background color to zero (black).

STRING$ The STRING function in line 1000 is used with the PRINT statement to print the character numbered 219. That's the character you see on your screen. Each character is represented by a number in the PCjr's ROM. The "C" represents how many of that character to print on each line.

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WORKSHEET 62 TRS-80 Model III Graphics

Enter this program and run it. Draw the picture that you see on your screen. Describe how it moves.

```
10 FOR LOOP = 0 TO 17
20 READ A,B
30 GOSUB 1000
40 NEXT LOOP
50 RESTORE
60 PRINT:PRINT:PRINT
70 GOTO 10
1000 PRINT TAB(A);
1010 FOR X = 1 TO B
1020 PRINT CHR$(214);
1030 NEXT X:PRINT:RETURN
5000 DATA 18,5,17,7
5010 DATA 16,9,15,11
5020 DATA 14,13,13,15
5030 DATA 13,15,14,13
5040 DATA 15,11,16,9
5050 DATA 17,7,18,5
5060 DATA 20,1,20,1
5070 DATA 20,1,20,1
5080 DATA 20,1,20,1
```

Description: _____

_____

_____

_____

_____

_____

Here are some BASIC keywords used in the program.

READ...DATA The READ statement at line 20 reads two pieces of information from the DATA statements and puts them into variables A and B.

CHR$ This function prints the graphics character that you see on your screen. Each character on the TRS-80 has a number from 1 to 255.

256

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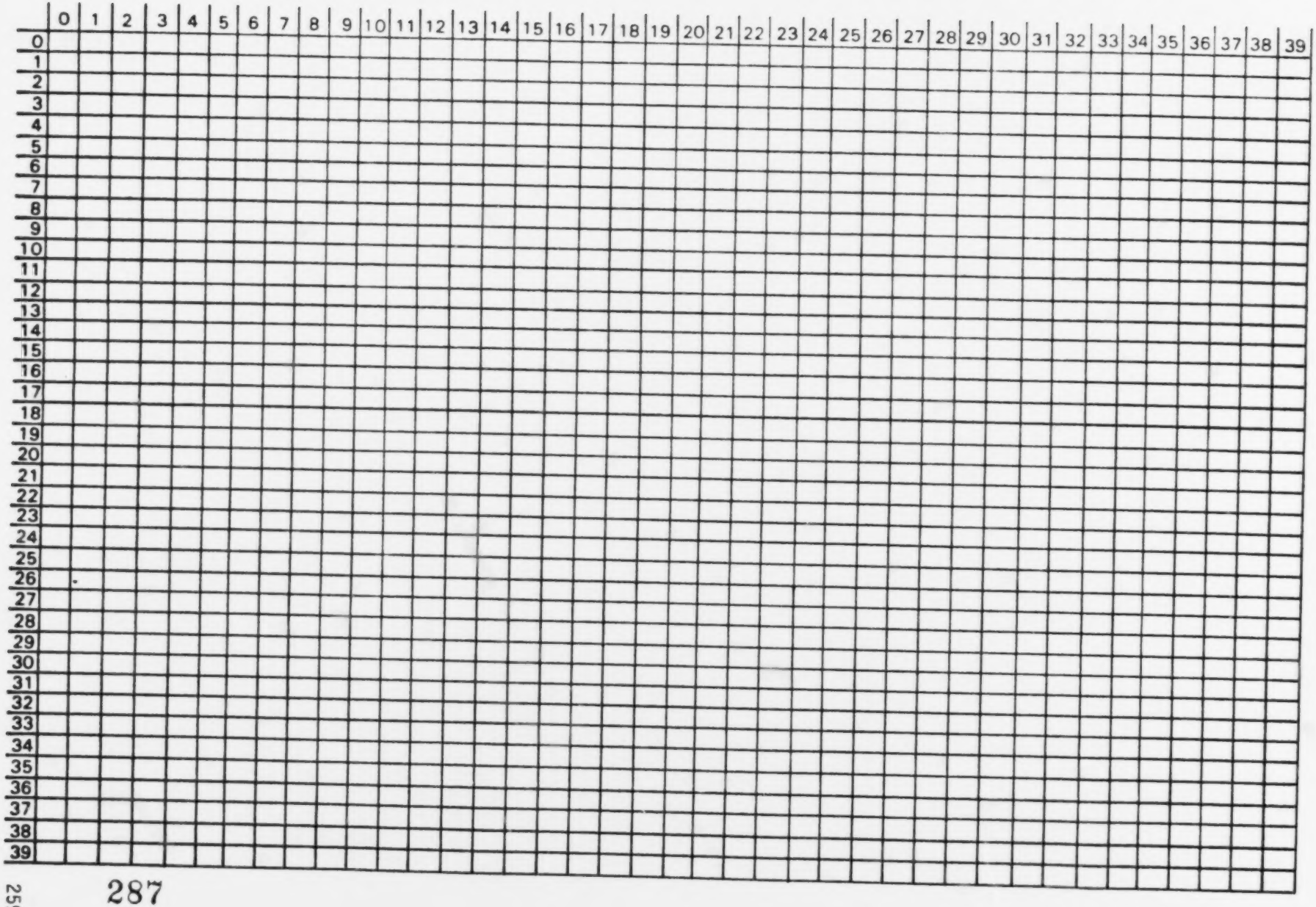
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39

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COMPUTER ASSISTED INSTRUCTION

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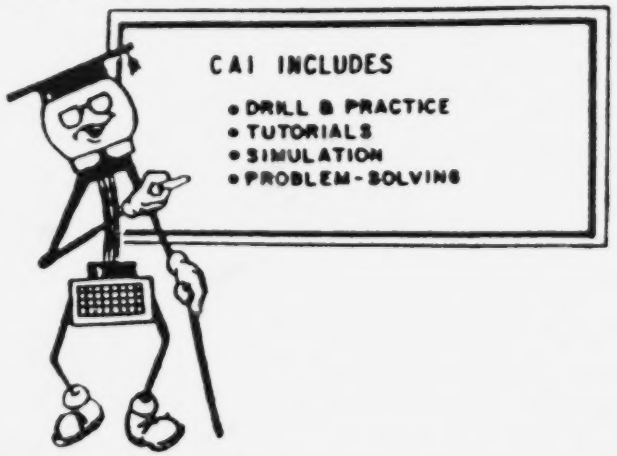
CAI

Computer Assisted (aided) Instruction is the process of using the computer as a learning aid usually by allowing the student to interact with a learning activity on a computer.

The microcomputer is an effective instructional tool which is capable of providing appropriate attention to the unique needs of each individual student, improving the availability, and use, of within-class instructional resources, and more effectively motivating the student -- regardless of his or her ability level.

The increasing attention being given to the use of microcomputers in educational settings raises this question in many people's minds: "Can computer assisted instruction replace the classroom teacher?" The answer is definitely no! Not at all. Though it is true that when the use of instructional computers was first started in schools, they were viewed as a means of finally providing each and every student with the one-to-one discovery dialogue which had been shown to be exceedingly effective by the Plato – the great master teacher of all time. In many respects, the early development of computer-assisted instruction was largely an attempt to recreate the unique interaction that occurs naturally between student and tutor in an individualized tutorial session. At this stage of development, however, it can be said most assuredly that the microcomputer and computer assisted instruction have yet to attain this "ideal" instructional level.

As generally used today, the term CAI of computer assisted instruction includes these four "approaches" *drill and practice, tutorials, simulation, and problem-solving.*



Literacy with Computers

To be functionally literate in America in the 1980s and beyond, implies that one has attained a quality high school level education or its equivalency, including computer literacy.

We recognize that there are many levels of proficiency inherent in the concept of computer literacy. We do not suggest that the skills of sophisticated computer programming are needed by the average citizen. However, we do believe, in general, that to function effectively in contemporary society, one should develop certain knowledge about and skills in the use of computers. The knowledge base involved developing an elementary understanding of what a computer is, what it can do and what it cannot do. This level of understanding might also include an awareness of some of the issues brought upon us by the "age of microelectronics."

The computer skill needed by most adults is that of being able to use a microcomputer and accompanying software as a device for learning as we ordinarily might use a book, audio tape, film or laboratory equipment and materials.

Results of a study using microcomputers with adult students (most young adults) indicate:

(1) The use of microcomputers resulted in faster attainment of the knowledge and skills needed to pass the GED (High School Equivalency Examination) and higher levels of student motication as measured by attendance, active involvement in learning activities and expressed interest and satisfaction by students.

(2) Their attention span is longer when they are interacting with computers than when being presented with similar information by human teachers.

(3) Involvement in the use of microcomputers has a positive effect on the self concept of the young adult learner.

---Using computers to facilitate learning.

(1) Involvement with computers is likely to be most successful when both teachers and students voluntarily engage in computer assisted instruction.

(2) Teachers should be thoroughly trained in the use of the equipment and in the nomenclature of the basic components of a microcomputer. We found that a two-day hands on clinic with 2 or 3 follow-up 1 or 2 day workshops provided adequate training for most teachers.

(3) Access to computers should be provided to small learning groups as well as individuals.

(4) Shy or seemingly withdrawn students should be given ample opportunity to learn with computers, otherwise the more outgoing students are likely to monopolize available time and equipment.

(5) Teachers should continuously monitor computer learning to be certain that all who want to participate have equal opportunity and time; that learners know how to properly "load" programs and operate the equipment; to give assistance when the computer cannot compute because of improper input; and to provide additional information, explanation, or clarification regarding concepts being learned.

(6) Students who show superior skill in using the computer should be encouraged to supplement the work of the teacher in assisting others

Suggestions To Consider In Selecting Commercially-Developed Computer Assisted Instruction Lesson Material "Software"

1. Does the instructional software being considered appropriately "match" your predetermined instructional objectives?
2. Does the instructional software's specific application (i.e., problem solving, drill and practice, tutorial) have potential for meeting the student's identified learning needs?
3. Does the instructional software prescribe entry level skills?
4. What are the experiences of other educators who have used the instructional software being considered?
5. Has the instructional software been evaluated adequately with respect to establishing its effectiveness in improving learner outcomes?
6. Can the instructional software be adapted to meet changes in the curriculum and in the way student needs might be more effectively addressed?
7. Does the vendor provide updates and error correction for the instructional software following purchase or lease?
8. Is the instructional software pedagogically sound? Does it provide for a diversity of instructional approaches; dependent upon individual student needs?

- Is the reading level used in the software appropriate for the intended student users?
- What length of time will the students be expected to use the software? In individual sessions? How often?
- What overall visual effect does the material have? Does it have appropriate "eye appeal?"
- Are the graphics used where appropriate to facilitate learning.
- Are content strands provided which contain a sequence of lessons ranging from easy to difficult?
- Are teacher manuals and/or student manuals provided to compliment the software, where such would be useful?
- Does the vendor provide adequate documentation concerning the appropriate reading level used to develop the software instructional content?
- Does the software provide "on-line" directio to the student while he or she is interacting with the computer?

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9 Is the instructional software user-controlled?

- Is random selection of software content possible?
- Can the user branch to various parts of the lesson for help, for example, to a glossary, and get back again to the place where he or she "left off"?
- Are the next steps the student will be exposed to made clear?
- Is the user able to control the reading rate and pace?
- Does the software permit the student to revise previous work during a session?

10 How does the software provide feedback to students?

- Are appropriate explanations given regarding why an incorrect response was unacceptable?
- Does the software program allow acceptance of incorrectly spelled answers? If so, is the spelling error corrected in feedback to the student?
- What provision is made for dealing with student input which is not recognizable by the microcomputer?
- Are all wrong answers given by the student treated appropriately without demeaning the student?

11. Does the instructional software program provide for permanent retention and management of scoring and student performance - or is it lost when the microcomputer is turned off?

12. Is the instructional software easily and quickly loaded into the microcomputer by the student, or is it susceptible to damage, or require complex procedures to load?

13. Will user training be required to effectively use the instructional software? If so, who will provide the training?

14. Does the instructional software vendor provide "backup" software and courseware disks, cartridges or tapes at a reduced price?

DRILL AND PRACTICE'S BAD RAP

ARE WE HONEST ABOUT OUR OBJECTIONS TO DRILL?

Computerized drill and practice has gotten a bad name. Administrators frequently welcome me into their schools with the hope that I will finally be able to show them some "good" software. They complain that after examining demonstration materials and looking through catalogs they have found little that is impressive. Most software they claim is only good for drill and practice, an activity they believe unworthy of a teacher's valuable computer time.

This is a curious attitude given most educators would agree, I believe, that drill is a necessary part of learning. For example, number facts are commonly presented to children void of any inherent meaning and must simply be learned through repetition. Other skills are basic to some higher-level skills (word identification to reading comprehension) and must eventually be executed without conscious effort. Such automatic recall can be obtained through the repetition of drill.

Since the educational community clearly believes drill and practice is necessary, it is logical that computer drill-and-practice activities would be common if evidence could show that the computerized approach was particularly effective. While educational research in general is often inconclusive, major reviews of computerized drill-and-practice studies (Bozeman & Burns, *Educational Technology*, 1981, *21* (10), 32-40; Vinsonhaler & Bass, *Educational Technology*, 1971, *12* (7), 29-32) seem to indicate a significant advantage for the use of the computer activities.

If research has demonstrated the value of computerized drill and practice, one might rightfully wonder why educators resist this application. I believe they base their resistance not on research data, but rather on comparisons with vague notions of ideal teaching methods. Let's examine three.

Objections. Perhaps critics see computer drill-and-practice activities as having limited value because good teachers and good teaching materials do not ask students to engage in repetitive, even dull, work. As a parent, I know this is not true. My son and daughter bring home stacks of dittoed worksheets nearly every evening. These worksheets frequently appear to require dull and repetitive activity.

Perhaps, then, teachers reject computerization of these worksheets as just too expensive. I wonder if people who think this way consider the in-school and out-of-school time my kids' teachers had to spend to score these worksheets. Since, in part, my taxes pay for this time, I would rather the time be spent working directly with my children or perhaps preparing to work with them.

Finally, critics feel perhaps that computerized worksheets just aren't necessary. I wonder if these critics have really looked at how paper worksheets are actually used in schools. My kids first see their worksheets in corrected form, at best, the day after the worksheets were completed. At that point I think they tend to look at the grade and probably feel good if they have done well and bad if they have done poorly. Even if they actually bother to look at the problems they have missed, the delay since they first did the exercises prevents them from reconstructing and evaluating their original mental activities.

CAI benefits. I must confess my biases and admit to being a strong proponent of microcomputer applications. Those general biases aside, there appear to me to be some intuitive arguments supporting microcomputer drill and practice in classrooms. First, the microcomputer can take the time to give the student the drill-and-practice attention that is needed. The computer will not tire of presenting problems or of correcting them.

Secondly, the computer can provide more immediate feedback. Admittedly, a teacher could also provide immediate feedback and perhaps provide additional useful instructional comments, but as stated earlier this is often impractical. I believe students need to have access to their thoughts, decision criteria, and recollection of other mental activities in order to make the most of feedback. This feedback must be given within moments of the student's original response for full access to these recollections. In a practical sense, I believe the student's likelihood of being able to operate in this time frame will be greater when engaged in computerized drill and practice.

Finally, the computer, at least theoretically, offers the potential for greater individualization. Learning tasks can be adapted, perhaps automatically, to a particular student's needs.

Improved products. Can computerized drill and practice activities be improved? Aside from obvious issues like the quality of the presentation, the avoidance of distractions, and the appropriateness of feedback, I think more could be done to take advantage of the computer's ability to gather and analyze data.

First, there is the matter of efficiency. Merrill and Salisbury (*Journal of Computer-Based Instruction*, 1984, *11*, 19-21) have used an analysis of errors to specify where practice time should be most efficiently concentrated. A second use might also be made of error analysis. Phye (*Contemporary Educational Psychology*, 1979, *3*, 381-394) argues that all errors are not the same. A computer could potentially record errors on a problem-by-problem basis and determine a pattern. An analysis of error patterns could be useful in assisting the student.

While I am as excited as the next educator by the potential of the computer to establish educational microworlds, it is clear that teachers use drill and practice in classroom worlds. So until we're ready to throw drill and practice out altogether, I'd recommend we continue to refine *computerized* drill and practice also.

Mary Grabe is Associate Professor of Psychology at University of North Dakota in Grand Forks.

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ESL PICTURE GRAMMAR

A helpful drill on English verb tense forms.

Grade Level: ESL students at intermediate and advanced levels
Instructional Design: Outstanding
Content: Good
Appropriateness: Outstanding
Interest Level: Good
Ease of Use: Good
Support Materials: Good
OVERALL VALUE: Good

Negotiating the thicket of English verb tenses is never easy for students learning English as a second language. Students need steady practice using these verbs, especially irregular verbs, before they can master their forms. The best way is for students to get immediate feedback as they practice individually, but few classrooms allow teachers the flexibility or the time to work individually with many students for long. Now *ESL Picture Grammar* can offer that individual attention to students. The program asks students to form sentences represented by easily understood pictures, and corrects them on the spot.

DESCRIPTION: This program manages to translate an activity that normally requires teacher dictation and picture cards into an independent activity. The object is to show students the idea behind a simple sentence and have them write it using a verb in its correct form. On-screen, the subject and object of the target sentence are represented by simple pictures. The verb is given in its first-person, present-tense form and students are asked to create a sentence using the verb and the two nouns. So, for example, the word "choose" placed between a picture of a boy and a picture of a ball, stands for the sentence "He chooses the ball."

As the student advances through the 24 levels of the program, the target sentence becomes increasingly complex. The program begins asking for negative statements or questions. It also asks students to form sentences in the past, future, and progressive tenses.

The program will test students on their mastery of the content of the 24 levels and store student scores.

STRENGTHS: This program is useful because it allows teachers to engage students in meaningful independent drill work that provides immediate feedback. In this way it helps to solve the management problem often associated with an ESL class that usually contains a diverse student population.

The exercises proceed in a logical, orderly sequence. Even as students move on to more difficult skills, the program returns every now and then to previously learned skills. This provides good reinforcement, and introduces some variety into the activity.

The comprehensive teacher's guide describes the program in an easily understandable manner. Picture and word cards are also provided for teachers to use in introducing the program so that students understand that the picture of a boy always stands for the pronoun "he." The program is nicely designed, and easily understood, something not always true of programs for ESL classes.

WEAKNESSES: While the program is designed for independent use, teachers will have to introduce its use carefully, explaining the function of the on-screen pictures and making sure students understand which word each picture stands for. There is no on-screen tutorial or introduction.

The program is thorough and complete, though repetitious after a while, because every sentence has the same structure: subject + verb + object.

—Reviewed by Joanne Marien, Principal, The Haldane School, Cold Spring, NY

Hardware: Apple II series (48K)
Publisher: Gessler Software, 900 Broadway, New York, NY 10003, 212/673-3113
Price: $59.95
Preview: 30-day preview available
Backup: Can be made from original
Circle 122 on Reader Service Card

MATH IN THE NEW AGE

ELECTRONIC LEARNING APRIL 1986

WHILE COMPUTERS ARE beginning to change many aspects of traditional instruction, their potential impact on the mathematics classroom is enormous. Not only will computers change how many traditional math topics are taught, but they will dramatically change the mathematics curriculum itself. Support for major curriculum reform in the not too distant future comes in many forms. The 1985 yearbook of the National Council of Teachers of Mathematics is an excellent source of arguments for this reform, as are most reports by the blue ribbon committees that have examined the current state of mathematics education in the United States.

Change will come because inexpensive software programs for school and home computers can do nearly all of the mathematical manipulations and calculations that are taught from first grade through calculus. Such programs can manipulate polynomial and trigonometric functions, factor and reduce polynomials, solve equations, integrate, differentiate, and even more.

There is every reason to believe that such programs, or their equivalent, will soon be available in a pocket calculator. That means that the overwhelming majority of our mathematics curriculum with its heavy emphasis on manipulation might be displaced by an inexpensive calculator. That's strong motivation to consider major curriculum reform.

TEACHING WITH CAI AND PROGRAMMING

The nature of this reform can be viewed as having two distinct parts. The first part is to make appropriate use of the computer to help teach those topics that are already in the curriculum. This is a familiar application that applies to nearly all curriculum areas.

The second part is modifying the curriculum so that it properly reflects the availability of the computer. This will certainly have the most significant long-term impact, as this will change the daily activities of everyone teaching mathematics in every classroom in the country.

Using the computer as a problem-solving tool is fundamental to both of these parts, and certainly a topic receiving considerable attention among mathematics educators. The curriculum should show students how to solve problems using software written by others and by teaching students to write their own computer programs. Both of these skills are very important.

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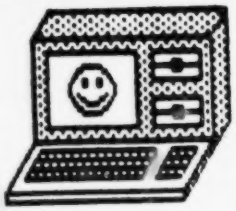
A complete list of the commercially available, demonstrably useful software for the mathematics classroom would be very long. The software ranges from arithmetic drill and practice to sophisticated analysis of student errors, and from traditional computation to higher-order thinking skills. One limitation in using most available programs is that they don't help solve problems chosen by the student. On the contrary, most of them present the student with yet another problem to solve. That's okay, but that's only one use of the computer and it does not provide the problem-solving assistance the student needs.

Teaching students how to program is, in my opinion, essential to their using the computer as a problem-solving tool. After students have learned to program, they can use the computer to address problems of interest to them. If someone else has already written a program that will help, then by all means, teachers should encourage students to use that program. However, the majority of problems are not likely to have pre-written software solutions readily available, and students will need to know how to program to apply the computer to their problem.

Do students need to develop the skills of a full-time programmer? Certainly not. Most of the programs they write to help solve a specific problem will be surprisingly short.

Must a math teacher teach programming? No, the most qualified teacher should do so. Programming is a tool that is useful in the study of mathematics. So is reading. If other teachers can teach both of these skills that's just fine.



ADAPTING THE CURRENT CURRICULUM

There will not be any sudden, dramatic reforms in the mathematics curriculum, no matter how desirable those reforms appear to be. Considering how the computer can be used to help teach those topics already in the mathematics curriculum is, therefore, very important. The following activities reflect the type of computer applications that will be contained in a revised curriculum, but all can be implemented in mathematics classes tomorrow. Tomorrow is the day after today—these are not suggestions for the distant future.

Activity 1: Algorithms and flowcharts are new words for old ideas. An algorithm is an ordered set of rules or steps to be followed to solve a particular problem or produce a particular result. A flowchart is a pictorial way to represent an algorithm. Students should be taught to create algorithms and express them in several different ways, one of which is a flowchart.

Consider the standard problem of solving a simple linear equation, something many students can do even prior to their first year of algebra. There is much to be learned by developing an algorithm to solve the general equation $Ax + B = 0$. Figure 1 is a flowchart of one valid algorithm.

By learning to create and express algorithms, students learn to consider all cases. The two cases when A is zero should not be overlooked. Teachers should check the algebra book used in their school. Both of these cases are probably omitted from the many pages of materials describing no more than what is contained in this flowchart. Show your students the equation above and ask them to develop their own flowchart.

WALTER J. KOLTKE, FORMER MATHEMATICS TEACHER AND DIRECTOR OF COMPUTER SERVICES, IS CURRENTLY THE DIRECTOR OF TECHNOLOGY AT SCHOLASTIC. HE IS ALSO THE AUTHOR OF *COMPUTERS AND MATH* (SCHOLASTIC) FROM WHICH THE ACTIVITIES IN THIS ARTICLE WERE TAKEN.

Activity 2: One of the most important problem-solving techniques in mathematics is trial and error. The computer has made this technique even more effective—trials no longer require a major computational effort. When students are taught trial and error methods, they become confident that they can solve any equation or inequality. That's much better than their current feeling that they can solve only a few special cases, and they can only do that if they can recognize the special case. Is this particularly hard? Here's a BASIC program to solve the equation

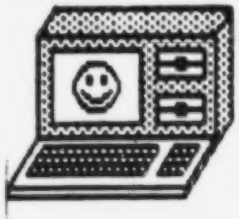
$$\sqrt{x^3} - 3x = 0$$

```
100 REM TRIAL AND ERROR SOLUTIONS
110 INPUT X
120 PRINT SQR(X^3) - 3*X
130 PRINT
140 GOTO 110
150 END
```

Using this program as a model, ask students to solve some similar equations or inequalities.

Activity 3: Simulations provide many opportunities for real problem-solving applications. The following is an example of a problem appropriate for junior high school students who can apply the computer as a problem-solving tool. Have students look at the flowchart and run the program that solves it.

Problem: Collecting baseball cards is a fast-growing hobby. Because the cards are wrapped when you buy them, you cannot know in advance which cards you are buying. If there are 30 cards in a complete set, how many cards would you expect to buy before getting all 30? One flowchart for the solution of this problem is given in Figure 2.



Apple and Commodore version:

```
100 REM BASEBALL CARDS
110 DIM C(30)
200 REM MAKE COLLECTION EMPTY
210 FOR E = 1 to 30
220 LET C(E) = 0
230 NEXT E
300 REM COUNT THE NUMBER OF CARDS
    BOUGHT
310 LET K = 0
400 REM BUY A CARD, PUT IT IN COL-
    LECTION, COUNT THE PURCHASE
410 LET B = INT(30 * RND(1) + 1)
420 LET C(B) = 1
430 LET K = K + 1
500 REM IS AT LEAST ONE CARD MISS-
    ING?
510 LET S = 1
520 IF C(S) = 0 THEN 410
530 LET S = S + 1
540 IF S <= 30 THEN 520
600 REM DISPLAY NUMBER OF CARDS
    BOUGHT
610 PRINT "You bought ";K;" cards "
620 END
```

Conversions for other computers:

TRSDOS: Replace line 410 with this:

```
LET B = RND(30)
```

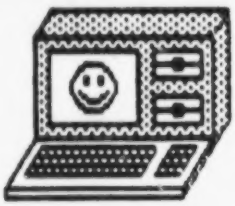
MS-DOS: Add this line to the program:

```
90 RANDOMIZE
```

Then, replace line 410 with this:

```
410 LET B = INT(RND*30) + 1
```

Solution: Choosing a random integer in line 410 simulates buying a pack without knowing which cards are inside. Each time it runs, the program will produce a different result depending on which random integer it begins with. To find the number of cards a collecter should buy, take the average of several runs.



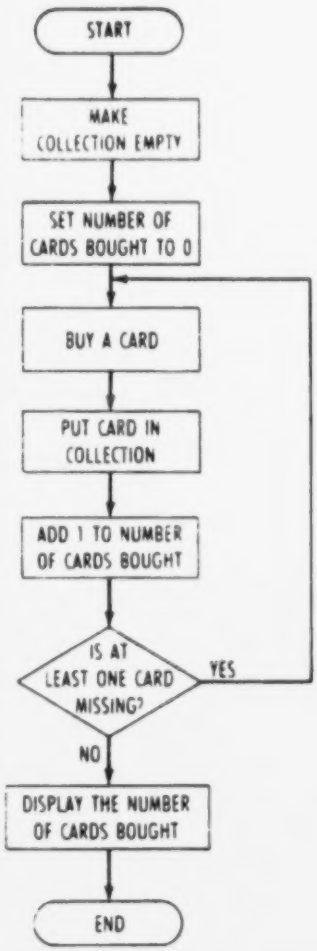


Fig. 2. A flowchart that shows an algorithm for determining the number of baseball cards to buy in order to collect a complete set.

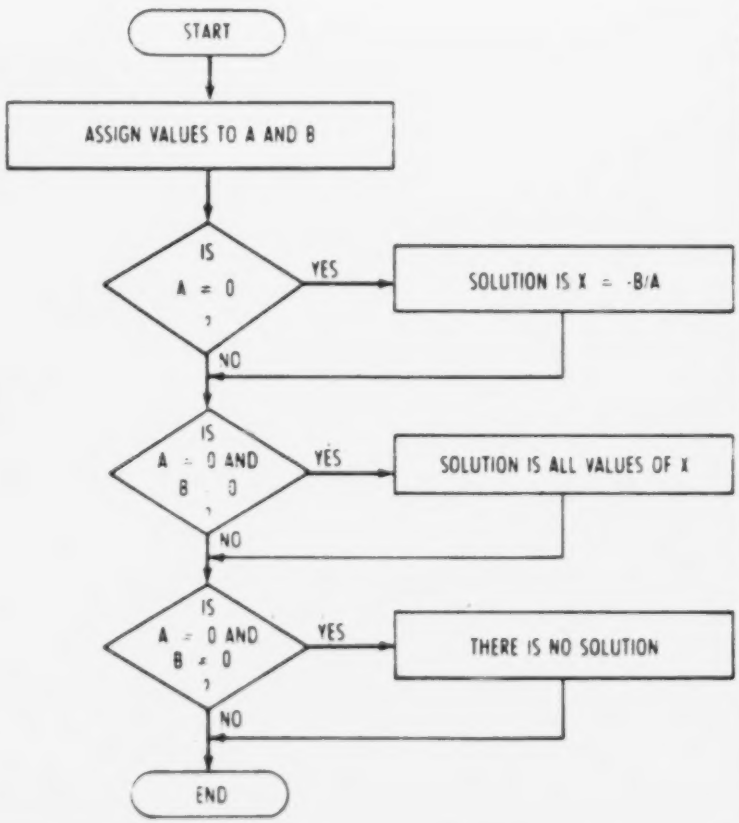


Fig. 1. A flowchart that shows an algorithm to solve the equation $Ax + B = 0$

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ELECTRONIC RESEARCH

ELECTRONIC LEARNING MARCH 1986

BY GWEN SOLOMON

On-line data banks, word processors, and data bases will help your students prospect for information

SPRING IS THE SEASON of the research paper. With the warmer breezes and lengthening days come the questions that mean it's term paper time again: "Where do I start?" "What am I supposed to do?" and "How do I look this up?" Every librarian and teacher who has taken students through the research process knows there's never enough time to give individual students all the guidance they need to find the right resources. But with more and more computers available in school libraries, teaching students to use reference materials can be made easier. Students can use software to find reference materials and learn how to use them.

The advantage of using the computer is that students can learn how to use library materials at their own pace. Then using data base and word processing programs, students can record and organize notes more efficiently for sophisticated research papers. And with on-line data bases, students have a new way to acquire research materials beyond the resources of their school. This article will introduce these three applications and suggest some activities teachers and librarians can use to help students find and use research materials.

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RESEARCH SKILLS SOFTWARE

Before students start their research, introduce basic reference materials with software. On the elementary level, *Library and Media Skills* by Educational Activities (Baldwin, NY; 800/645-3739) presents information about basic reference materials. Students practice selecting the best resource in which to find information using a simulated card catalog, encyclopedia, almanac, dictionary, atlas, book of quotations, thesaurus, and book of world records.

How Do I Find It If I Don't Know What I'm Looking For? from Sunburst (Pleasantville, NY; 800/431-1934) helps older students develop search strategies to locate resources. The program poses a series of questions about the student's topic. Depending on how the questions are answered, the program takes students to descriptions of standard reference materials. Teachers or librarians can easily customize the program so that it will direct students to resources in their school or library.

Library Skills by Bede Software (available from Films for the Humanities, Princeton, NJ; 800/257-5126) is the most sophisticated of these library simulations. Students explore a simulated card catalog, stacks, an encyclopedia, magazine catalog, non-book catalog, non-book materials, and contemporary biography collection. *Library Skills* contains six topics for students to practice researching. After finding and collecting facts in the various sections of the simulated library, students can compare their results with a model search. An on-screen librarian is always nearby to explain how to use materials.

APPLICATIONS SOFTWARE

Once students have learned how to collect information, the real test is writing a term paper. For this task, the computer is an exceptionally useful tool for organizing and presenting information. Students can use a data base to record the information they gather. They can create a file for each subtopic and store citations and text in individual records.

A data base helps students make sense out of the traditional stack of file cards that will not put themselves

Cracking the Toughest Reference Book: Compiling a Computer Dictionary

By Mary Lee Shalvoy

The dictionary can be the toughest reference book for students to crack. There's so much information, even in school editions, that students are often intimidated. Thick, threatening dictionaries stand unopened, unused, and dusty on the classroom shelf.

Teachers often introduce the dictionary by having students create their own. This is a valuable exercise, but there are drawbacks. If every student creates his own dictionary none can be very comprehensive. If assembling the dictionary is a group project, organizing the information and presentation of the dictionary can be a nightmare. Here's a solution with an interesting twist: Compile a computer dictionary. Using commercial software, or programs of their own, students can learn everything you want them to know about dictionaries.

Here are three ways for students to use a computer to create a dictionary. For each, start with a list of the vocabulary you would like included in the dictionary. Your students will need a good dictionary to serve as a source for theirs. If you are using a vocabulary list from a technical area, make sure the students have a science or technical dictionary.

1. Commercial Software. The easiest way to create a computer dictionary is to use commercial software. Any vocabulary software that allows teachers to enter their own vocabulary lists and definitions will do. One that is widely available is Davidson's *Word Attack!* (Torrance, CA; 800/556-6141). The program is a four-part vocabulary building program that contains nine levels of vocabulary. There are extra data disks you can buy to supplement the list.

Here's an activity that works with *Word Attack!*

1. Give the students a group of 5 to 25 words.
2. Have the students write a short definition for each entry, using a dictionary. Each definition should take up fewer than 36 letters and spaces.
3. Ask students to write a sentence showing how the word is used.
4. Next have students write a sentence where the word is missing, but the context makes the meaning clear.
5. Have students enter their information into the program and then test each other with the activities in the program.

Using a commercial vocabulary program is easy, but means sacrificing some flexibility. You have to set up your dictionary the way the program is set up. You have more flexibility, and can structure your information more like a dictionary if you create it using a data base program.

2. Data Base Programs. You can create a dictionary with any data base program. Two particularly easy-to-learn ones are Grolier's *Friendly Filer* (Danbury, CT; 800/858-8858) and DCH's *Notebook Filer* (Lexington, MA;

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into manageable order. Once students have rough outlines for their papers in mind, they can use the search and sort functions of their data base program to organize their research information. For each subtopic in the outline students can search their data files and print out supporting facts and citations. Students can also create a bibliography from their research notes. Any data base program can be used; one program specifically created for assembling research notes is Grolier's *Note Card Maker* (Danbury, CT, 800-356-5586).

When all the notes are arranged, students can use a word processor to write the term paper. They can organize the report as they wish and then revise it. True revision is possible with a word processor since anything—words, order of ideas, focus, and position of quotes—can be changed easily. For a technical report, students can use a spreadsheet to create charts and display statistical analyses. Integrated programs that allow students to mesh graphs, charts, and text created with word processing, data base, and graphics programs are ideal. Several are available. They include *Appleworks* from Apple (Cupertino, CA, 408-996-1010), the Scholastic PFS series (New York, NY, 212-505-3537), and Tandy's *Deskmate* (Ft. Worth, TX, 817-390-3700).

ON-LINE DATA BASES

Since library resources are limited by funds and by the physical constraints of the room or building, vast amounts of information that are current, relevant, and necessary are available to students through on-line data bases. With a computer, modem, dedicated phone line, communications software, and a subscription to one or more information retrieval services, students have access to technical information and a limitless number of references. A trained teacher or librarian can help students learn to retrieve information. While on-line searches can be expensive, advantages to this form of research include speed and accuracy. Citations and documents can be downloaded to the students' computer and stored on disk or printed out. (*For a complete primer to on-line research, see* EL, *November/December 1984, pp. 33-40.*)

617-862-6650).

1. Have students choose vocabulary words from a subject they are now studying.
2. Using a dictionary, have students find six items of information for each word: pronunciation, etymology, short meaning, synonym, antonym, etc. Set up the data base with those items as fields.
3. Once students enter and save the material, activities depend on the capabilities of the program. Students could print out a list of antonyms and try to guess the original word. Or students could have the program sort the words in alphabetical order to print out a full dictionary.

3. Programming. For a computer class, assembling a dictionary data base is a great program design activity. The following activity has students write a BASIC program that displays a word, its meaning, an antonym, and a sentence that includes the word.

1. Start by choosing a list of words for the data base. For each, have students write a definition, an antonym, and a sentence using the word.
2. Set up the data base. The information is stored in program lines called data lines. Data lines are numbered, so they can be made part of a program when you want the computer to process the data. Programmers usually use high numbers for data lines, so that there are lots of numbers left for program lines.

The data for this program will be stored in pairs of lines. The first line contains the word, the definition, and the antonym. The second line contains a sentence using the word.

Have students start the data base at line 1000. Separate the items of information with a comma. Line 1010 will contain the word in a sentence. These might be the entries for the word "splendid."

```
1000 DATA SPLENDID,BRIGHT OR
     SHINING,DULL
1010 DATA THE PARTY DECORA-
     TIONS LOOKED SPLENDID
```

The data lines for the next word on the vocabulary list would follow on lines 1020 and 1030.

3. End the data base with these two "dummy" lines. Our BASIC program will look for these to know when it has read all the data.

```
9998 DATA WORD,DEFINITION,AN-
     TONYM
9999 DATA SENTENCE
```

4. The last step is to have students write a program that processes the information in the data base. The following sample program asks the user to type in a word, then prints its definition, antonym, and a sample sentence for the word on the screen.

Apple version:

```
10 REM DICTIONARY DATA BASE
20 HOME
30 READ WS,DS,AS
40 READ STS
50 IF STS = "SENTENCE" THEN GOTO
   150
60 PRINT
70 INPUT "SELECT A WORD ";XS
80 PRINT
90 IF XS = WS THEN GOTO 110
100 PRINT "NOT IN DATA BASE. TRY
    ANOTHER WORD ": GOTO 60
110 PRINT "WORD ";WS
120 PRINT "DEFINITION ";DS
130 PRINT "ANTONYM ";AS
140 PRINT "EXAMPLE ";STS: GOTO 60
150 END
9998 DATA WORD,DEFINITION,
     ANTONYM
9999 DATA SENTENCE
```

Conversions for other computers:

Commodore: Replace line 20 with this: PRINT "[ ]"

TRSDOS: Replace line 20 with this: CLEAR 25

MS-DOS: Replace line 20 with this: CLS

Mary Lee Shalvoy is a freelance writer who has trained many teachers in the use of computers.

The DIALOG Information Retrieval Service (Palo Alto, CA, 800 227-1927) includes indexes to five newspapers, over 100 periodicals, and approximately 200 data bases covering the sciences, technology, engineering, law, social sciences, business, economics, and more. A special index helps students determine which data bases may be helpful for their topics, and a reduced rate is available for academic institutions.

Bibliographic Retrieval Services (Latham, NY, 800 833-4707) provides library references such as *Books in Print* and more than 80 data bases in the sciences, medicine, business, education, social sciences, and humanities.

In addition to these and other bibliographic data bases, The Source (McLean, VA, 800 336-3366) and CompuServe (Columbus, OH, 614 457-8600) are general information services that offer access to encyclopedias, news, and electronic mail, among other things. These too can help students access current information for their research.

THREE RESEARCH ACTIVITIES

When students know their tools—both reference sources and software—they'll be able to make good use of computers in preparing research papers. Here are some activities that will introduce students to both.

1. Introducing Reference Sources. To have students learn about traditional reference materials, have them create a chart covering the basic reference texts in the school library. Across the top of the chart, place the headings "Source," "Type of Information," "Arrangement," and "Special Features." Give students a list of basic reference sources in the library, and have them fill in the three remaining categories. A sample entry might look like this:

Source: *The World Almanac*
Type of Information: facts on people, places, science, sports, music, art, government and politics, literature, entertainment, business
Arrangement: by subject
Special Features: published yearly, summary of year's news, index by topic and name in front, quick index in back

2. Creating a Data Base of Resources. A variation of the above activity can be used to create a computer data base of library resources that students can use to start their research.

- Using a data base program, design a form with the fields used above: "Source," "Type of Information," "Arrangement," and "Special Features." You may also want to add a

WITH COMPUTERS, LIBRARIANS AND TEACHERS CAN GIVE STUDENTS THE INDIVIDUAL RESEARCH SUPPORT EACH NEEDS.

new field, "Location," for students to indicate where the source is stored. Locations might include various classrooms, the school library, or a public library. Students might also indicate the Dewey Decimal number or the Library of Congress number of the source, if the source is cataloged in that way.
- Create a list of topics that students can use to fill in the "Type of Information" field. Each entry must describe information the same way, in order for students to be able to search the file later. A list of topics might include these: *animals, art, automobiles, business, careers, entertainment, geography, government and politics, hobbies, literature, music, people, places, religions, resources, science and technology, sports, world records.*
- Assign each student a different resource, or resources, to catalog. Have them type the information on their resource into the data base.
- Then have the students do some practice searches on their data bases. For example, ask students to locate the resources they would go to for a biography of President Reagan. (They would search for every entry with "people" or "government and politics" in the "Type of Information" field.)

3. Using Data Bases for Note Taking. After students have started their research, have them create and use some simple data base files to organize their notes. Using material collected on their topic, they can practice searching and sorting their file to come up with a rough outline for their research paper. Have them type up their outline using a word processing program.

A data base for research notes might use these fields:

Topic:
Subtopic:
Source:
Page:
Notes:

A data base of sources that can be used in preparing a bibliography might use these fields:

For Books

Author(s):
Title:
City of Publication:
Publisher:
Year Published:
Pages:

For Periodicals

Author(s)
Title of Article:
Title of Periodical:
Volume and Number:
Pages:

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ARTICLES

THAT NEED

TO BE

READ

TEXAS LEADS THE WAY

Arthur Luehrmann
Partner
Computer Literacy
Berkeley, CA 94708

You Texas folks have done something that my state and most other states are still chewing over. I'm talking about the statewide computer literacy requirement, of course. Mind you, I'm not saying that you're the only people under the sun who think computer education is important. Nearly everyone in education, from the substitute teacher to the Secretary of Education, seems to think it would be nice for kids to have a chance to learn about computers. Every year there are twice as many computers in U.S. schools as there were the year before. Most secondary schools and many middle schools have classes in computing. Learning opportunities exist nationwide as never before.

And that's as far as most state computer education policies dare to go: the creation of *opportunities*. Opportunity, however, is not enough. Opportunities abound for learning a foreign language, studying great literature, and exploring history, yet how many take the opportunity? All kids have an opportunity to study math for 12 years, but few do. They all go through high schools that offer three or four years of science classes, but few avail themselves of the opportunity.

And what of the young people who do seize such opportunities? Walk into a twelfth grade math or science class and you won't see the average high school senior sitting there. Instead, you're likely to find more boys than girls, more light faces than dark ones, and many signs of affluence and advantage.

As many reports prove, this is also what happens when the computer class is only an opportunity. The math jocks flock to class, and others feel it just isn't for them. And, in fairness, the math-shy kids are often right. When a computer teacher is faced with a mathematically sophisticated bunch of kids, it's awfully difficult *not* to pitch the class in a direction they're eager to trot. That may be why so many elective computer classes look like thinly disguised math classes.

Texas educators (and legislators) have given the problem a great deal of thought and have done exactly the right thing. Computer literacy is too important to all concerned – kids, their parents, and the society as a whole – to be left as an elective subject. Furthermore, by requiring all students to take a computer literacy course, you folks have, neatly and simply, sliced through the Gordian knot of inequity that entangles the elective computer classroom.

I don't mean to gloss over the difficulties that remain: acquiring equipment rapidly enough to make hands-on experience the backbone of the class, providing training opportunities for computer teachers, selecting appropriate instructional material, evaluating student performance, and the like. None of this will be easy, and because of this fact, a grave danger lurks just around the next bend.

Having decided that *all* kids will enroll in a computer literacy class, computer educators can expect pressure from various sources to weaken course content. Many, believing that a real hands-on introduction to computing is too hard for average kids, will press for a watered down, let's-all-read-about-computers course, in which kids learn hardly any useful skills.

What's the best response to this pressure? Here's what I heard one Memphis teacher shout back at an administrator who wanted a weaker course for "average kids": "Don't you sell my kids short! Don't tell me what they can't learn, you come to my classroom and see for yourself!" Amen, lady. It's essential that this message be brought home to worriers. The job is up to computer teachers. I know many of you, and I know you can do it.

COMPUTING WORLDWIDE

ELECTRONIC LEARNING MARCH 1986

SEVERAL COUNTRIES HAVE EMBARKED ON NATIONWIDE SCHOOL COMPUTER PROGRAMS

"OUR GOAL AND THAT OF THE President of the Republic is to turn the present generation into the best trained in our history," said French Prime Minister Laurent Fabius when he announced his government's plans to install microcomputer labs in all of France's 50,000 schools.

France is one of four industrialized countries to have embarked upon nationwide computer literacy campaigns in the past two years. Japan, the Soviet Union, and Italy are the other countries that have launched educational programs, although it is still too early to assess the progress made by the latter two. Britain, meantime, has had a computer literacy program for five years.

Indeed, since Britain began its national computer literacy scheme in 1981, virtually every primary and secondary school in the country has installed microcomputers. The Department of Trade and Industry paid half of the cost for the first microcomputer installed in each school, at a total cost of 12 million pounds ($15 million).

The purchase of these first microcomputers was designed to raise the awareness of teachers, parents, and administrators in the potential of computers in education. It worked. According to Geoffrey Hubbard, director of the Council for Educational Technology that administers Britain's computer literacy project, the average school now has 15 microcomputers, mostly financed by local school boards and parent-teacher associations.

In France, microcomputer networks capable of supporting T-12 computers were installed in all secondary schools and the 10,000 largest primary schools. Smaller primary schools received one computer each. The schools also received monetary handouts with which to purchase software, bringing the total cost of the project last year to 200 million francs ($20 million).

Japan prefers to follow the British example, however. It spent two billion yen ($8 million) in 1984 and a further four billion yen ($16 million) last year to subsidize the purchase of the first microcomputer for each of Japan's primary and secondary schools. At the moment it is estimated that less than 5 percent of primary schools and less than 30 percent of secondary schools in Japan own microcomputers.

Teacher Training. The greatest problem facing educational computing, however, is the reluctance of teachers to learn about the new technology, according to officials in all the countries. In an effort to combat the problem, Britain, France, and Japan have all coupled their microcomputer financing with massive teacher-training programs.

In Britain, each school that received subsidized microcomputers sent at least two teachers for training. The Department of Education and Science developed courses at three different levels that have been attended by more than 100,000 teachers in the past three years. Most teachers enroll in a four-day "awareness" course. They also receive training packages, software, and suggested course schedules.

British teachers and teacher trainers give mixed reviews to such short courses. Most educators report that although the courses increase teachers' awareness of what computers can do, teachers still emerge without a full understanding of how best to use them. Local education authorities, furthermore, are reluctant to release teachers from their duties for very long.

France started advanced teacher training courses in 1981. Two thousand school teachers—more than half from nonscience disciplines—received a year of full-time training in the educational applications of technology at 27 university centers around the country. In turn, these teachers helped train 110,000 other teachers in one-week courses held during school vacations.

The Japanese have opted for a more gradual process in the establishment of computer education in schools. The introduction of computers and the training of teachers will be spaced over the next few years. This process may be less threatening to teachers, said Takashi Sakamoto, a member of the four-man "Special Committee on Primary and Secondary Education in the Information Society" at the Ministry of Education. According to Sakamoto, the committee has developed a three-level, teacher-training curriculum that will be used by trainers from educational centers, universities, and private industry.

As a further aid to teachers, the Japanese are developing model software programs and standards for software evaluation that are to be distributed among the schools. The Ministry of Education already publishes a monthly journal to keep teachers informed of new developments in educational computing.

In a similar program, the French Ministry of Education evaluates software from around the world and compiles a catalog of software approved for school use, the cost of which is subsidized by the government.

COMPUTERS INCREASE IN SOVIET SCHOOLS

Computer classes are now part of the curriculum in all Soviet secondary schools, according to a recent article in the *Christian Science Monitor*. Computers are also being phased into Soviet *Kombinats* (teaching and job training complexes, similar to American vocational schools).

Most of the keyboards on computers used by Soviet children have both English and Russian letter keys on them. That's because in many cases children must use programs that are driven by English commands. Typing in English, however, tends to slow Soviet children down somewhat.

Even so, Soviet children find computers entering into their lives more and more all the time. "Perhaps one day," predicted one 15-year old girl enrolled in the program, "there will even be computers that can be used in the home."

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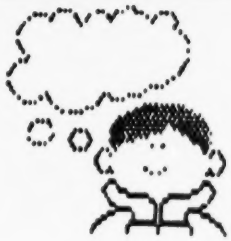


POETRY FROM PLANTS

I've always said that Apple owners come up with the most creative and offbeat uses for their computers, and a letter I recently received from Joe Sanchez of Long Beach, California,

serves as an excellent example of that point. Sanchez is an aerospace engineer and former nuclear-weapons specialist who talks to his plants. The difference is that for the past two years, his plants have been talking back. In fact, with the assistance of an Apple, the plants even write poetry.

Sanchez read the book *The Secret Life of Plants* and was intrigued by the research that indicated that plants gave off electrical charges in response to environmental stimuli. To further explore this phenomenon, Sanchez constructed a device that combined an Apple II system, a voice synthesizer, sensitive electrodes for attaching to plants, and a 30K program he wrote to convert impulses from the plants into words.

Although Sanchez admits that plants can't think or theorize, he maintains that plants can react to humans. Sanchez believes that valuable practical applications may result from his experiments; currently, Sanchez is pursuing the possibility that plants can serve as a sort of watchdog to detect the presence of people, an application he feels may be useful in creating security and alarm systems.

Retooling Your Business Education Curriculum

How to Prepare Your Students for an Electronic Future

The business world is changing, and more and more business education specialists are adapting their classroom practices to suit. Here are some ideas for how you can fit microcomputers into your own curriculum as well.

By Russell W. Guthrie and Deborah H. Guthrie

Russell Guthrie is an educational computer consultant with Guthrie Computer Solutions in Watsontown, PA. Deborah Guthrie has taught Business Education for five years and is now an assistant at Guthrie Computer Solutions.

IT'S STILL A CLASSROOM—THE BLUE-JEANED STUDENTS BENDING OVER HOMEWORK ASSIGNMENTS ATTEST TO THAT. BUT MORE AND MORE THESE DAYS, THE BUSINESS EDUCATION RESOURCE CENTER AT MILWAUKEE'S WASHINGTON High School is taking on a different look. Six of the students are bending over microcomputer keyboards, working with accounting and electronic spreadsheet software programs. A few others tap away on electronic typewriters; yet another sets the controls on a high-production copier. Soon, these students and others will be working with a computerized telephone system and a Wang Alliance Word Processor.

This classroom is being transformed into an office—a sophisticated, state-of-the-art, *electronic* office. It's becoming the perfect setting for Washington High's new course: "The Office of the Future," designed to simulate an environment students are likely to encounter when they enter the business world.

Like their colleagues at many other schools, educators at Washington High are worried about preparing students for a tight job market—one that's requiring new technology-related skills. They see surveys showing that by the time this year's eighth graders graduate, an estimated 75 percent of all jobs will be related to information processing. And they have decided it was time to act.

"By exposing students to a technological environment now," explains "Office of the Future" Teacher Marilyn Schmidt, "we're not only helping them to feel basically comfortable with the equipment, we're also better preparing them for any business job."

Obviously, not every school may be able to provide its business education students with access to as much sophisticated hardware as Washington High. But even with a single microcomputer—and the right software—any school can go a long way towards helping students learn to create and revise text, maintain and merge files, and complete payrolls electronically—skills they'll need for that office of the future. *(Continued)*

taken from ELECTRONIC LEARNING, April 1983

START WITH SOFTWARE

THE FIRST PLACE TO BEGIN RE-structuring your business education curriculum is with software. And, thanks to the hundreds of programs that have been written for the "real" business world that can—and should—be used in the classroom, business education teachers have many programs to choose from. Start with the "Big Five" in office software. These five business packages form the foundation of information processing and include:

1. Data Base Managers—to file, store and retrieve information.

2. Graphics Packages—to visually depict information with line, bar, and pie charts.

3. Electronic Spreadsheets—to manipulate information and help predict the future.

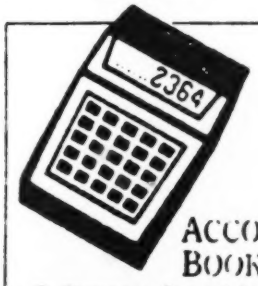
4. Word Processors—to create and edit text.

5. Data Communications Packages—to allow one micro to communicate with another and to retrieve information stored on mainframe computers.

To supplement these five, there are a number of programs designed for specific business applications, such as keeping track of payroll and completing tax forms, as well as programs that actually teach and drill business practices. (For information on some business programs designed for the educational market, see the chart on pages 59-60.)

DEVELOP NEW TEACHING STRATEGIES

Once you've selected your software, purchased the appropriate microcomputer to run that software, and acquired a hard copy printer, you're ready to begin to restructure your curriculum. Keep in mind that your course content will not necessarily change; the principles of accounting are still the principles of accounting. But there will be new teaching plans and strategies that you'll want to develop. What follows are some ideas for how to augment your treatment of all the traditional business education subject areas—from typing to business law—using the electronic techniques of the Eighties.



ACCOUNTING/ BOOKKEEPING

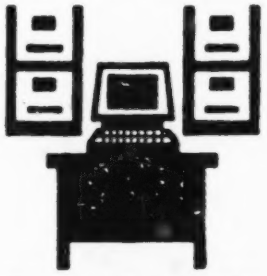
Software: financial management programs (payroll, accounts payable, accounts receivable, general ledger, order entry, and checkbook accounting); tax preparation program

Teaching Suggestions: • Using your standard simulated company practice set, have a group of students set up a phantom company and keep the books on the microcomputer. Have each group produce payroll checks (use continuous form checks if available), accounts payable checks, invoices, and profit and loss statements. • Go to your local IRS office and get some actual IRS forms and schedules. Have students use one of the many federal income tax preparation programs. Most of these will print out information on the official federal form (a single-sheet printer is desirable).

TYPING

Software: typing tutor program; word processing program

Teaching Suggestions: • Teach beginning typing in the usual manner and then introduce a typing tutor program. These programs help students build and improve typing speed and accuracy; some also keep track of student progress. • Toward the end of a typing course, it would be a good idea to introduce students to word processing. They will already be familiar with the keyboard, and this will prepare them for future courses where the full editing capabilities of the word processor are taught. Have students type in an assignment from another course, such as an English essay, and print it out.



OFFICE PRACTICE

Software: spreadsheet; data base manager; graphics package; data communications package; word processing program

Teaching Suggestions: • Introduce the electronic spreadsheet. Have students set up a mock school budget and allow one of the input variables to be percent raise for employees. This would allow students to then ask "What if?" questions: What happens to the total budget amount if all employees receive an 8.8 percent raise next year? How many mills of tax does this amount represent? What happens with a 10.8 percent raise? • Introduce the data base manager. Have students define a set of data items that one might find in a company personnel file. For example: name, address, date hired, supervisor, building, years of experience, salary, and so forth. Then ask them to enter a record for each member of the class pretending each one is an employee of the company. Students can then use the retrieval capabilities of the system to ask for a report—on all employees that were hired since a given date and have less than three years experience, for instance. • Introduce the graphics package. Ask students to produce a bar chart or graph based on the information stored on the data base manager, such as a graph showing the years of experience of employees in a given building. • Have students prepare a letter, report, or memo using the word processing program, following the old rules for margin, letter style, spacing, and paragraphing. Have them present the final copy; then rewrite a sentence or two for them. Have them make the changes themselves to see how quickly and easily it can be done. • If your word processing package has merge capabilities, have students type in three or four names and addresses in a standard word processing file, and a form letter in a different file. Then have them merge the two files, so a letter will go to each name from the name and address file. • Introduce a data communications package. Have each student type a letter using a word processor and then send that letter to a remote micro in the school district.

SECRETARIAL PRACTICE/ TRANSCRIPTION

Software: word processing program; spelling checker; electronic thesaurus; automatic calendar

Teaching Suggestions: • As in a traditional secretarial course, focus on the "mailable" letter. Start by dictating a letter and have the students key it in on the word processor. Have students use a

(Continued on page 85)

Electronic Bulletin Boards: A Retrospective

Bulletin boards have been with us in one form or another for hundreds of years and will likely stay with us well into the future. Why? What's so special about bulletin boards, electronic or otherwise?

It's difficult to pinpoint when the first bulletin board appeared. Perhaps cave paintings were primitive bulletin boards. In the modern sense of a community communications media, the earliest bulletin board may have been the medieval practice of posting royal proclamations in the center of commerce, the town square.

The traditional bulletin board, with a wide variety of messages tacked to a freely accessible surface, abounds in our supermarkets, factories, offices, schools, laundromats, community centers, and city halls. These bulletin boards are more than just a way to give away kittens or sell tires. They make it possible for people with a message to reach out to the community as a whole.

Electronic Thumbtacks

The thousands of computer-based bulletin board systems (BBSs) which are online today offer the traditional message posting and a great deal more. Imagine trying to maintain a series of communications with other people using a regular bulletin board at a supermarket. Driving to the store every time you want to leave or read a message makes extended communication via corkboard and notecard extremely inconvenient. Even if you make the trip regularly, a less than careful search of the posted messages may miss the very reply that was sought.

The fact that a BBS can be accessed remotely, without leaving one's home, makes an ongoing dialog between many parties a simple matter. A computer dedicated to running the BBS manages the messages; in addition to numbering and indexing the messages, it also automatically notifies its many users of messages intended specifically for them.

The first BBS was born of necessity in 1978. Microcomputers were just getting off the ground, and the first micronauts were few and far between. The four major enclaves of personal computing were located in California, Illinois, Texas, and Massachusetts. Although the computer clubs in these areas exchanged newsletters regularly, there was a decided lack of spontaneous interaction between the major groups and even within the groups themselves.

Ward Christensen and Randy Suess, both members of the Chicago Area Computer Hobbyist Exchange (CACHE), came up with the answer. They developed a program to run on a computer that was equipped with a modem hooked up to a phone line. The program turned the computer into an automated message system. Callers to the Computerized Bulletin Board System (or CBBS, as its originators referred to it) could leave and retrieve messages at any time of day. The CBBS was a huge success, and other clubs began pressing personal computers into service as bulletin boards.

The Spread Of BBSs

CBBS was not a universal program. It was written for computers which used the CP/M operating system (Control Program for Microcomputers). Christensen and Suess wrote a widely publicized article describing the program and the structure of their system as it appeared to the person calling into the CBBS. Realizing that similar programs would be written for other types of computers, they proposed that the functions and commands used by the CBBS be standardized for all BBSs. This would make it unnecessary for people to learn a whole new set of commands for each type of board they accessed.

Sure enough, BBS software for other popular systems soon followed. Craig Vaughn and Bill Blue created a program for Apple II computers called the People's Message System (PMS). Close on their heels was Bill Abney, who produced Forum 80 for the Radio Shack TRS-80, and Tom Giese, father of the Atari Message & Information System (AMIS) for the Atari 400 and 800. Late in 1982, the first version of the Remote Bulletin Board System (RBBS) for the IBM was written by D. Thomas Mack and Jon Martin.

Aside from a message exchange, most BBSs offer a selection of public domain programs and other types of files. By using terminal software capable of receiving files via modem from a remote computer, callers can transfer (download) copies of these files from the BBS to their own machines.

Most of the free software available from BBSs consists of programs that computer enthusiasts like yourself have written and wish to share with other people. A plethora of games, word processors, spreadsheets, database managers, and terminal programs are available for the price of a phone call. Whatever your needs, you can acquire a respectable library of almost-free software that will handle all but the most demanding tasks.

Next Month: Current Trends in Bulletin Board Systems. C